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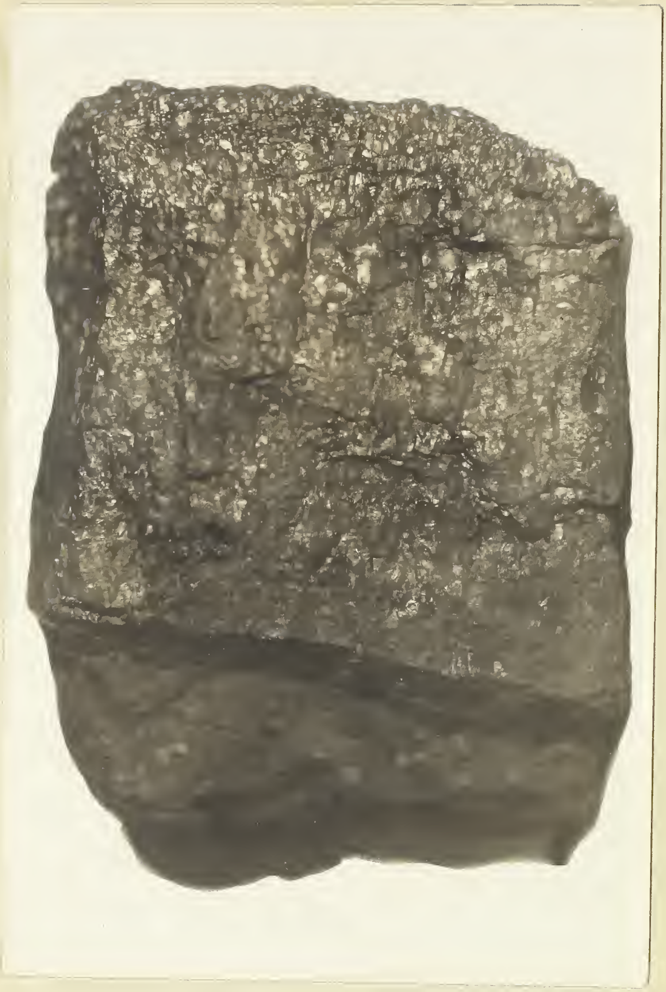

Plate 1. A Lump of Coal Showing "Curly" Structure, from the Clover Bar Seam in the Beverly Mine.

THE GEOLOGY OF THE COAL SEAMS OF EDMONTON AND DISTRICT

AND

A HISTORY OF ITS MINING DEVELOPMENT.

by

Hugh Hamilton Beach, B.Sc.(M.E.)

University of Alberta
Edmonton
1934

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THE GEOLOGY OF THE COAL SEAMS OF EDMONTON AND DISTRICT

AND

A HISTORY OF ITS MINING DEVELOPMENT

Chapter I

INTRODUCTION, SUMMARY and CONCLUSIONS

Twenty-five years have passed since Dr. D. B. Dowling of the Geological Survey of Canada made the first systematic and detailed study of the coal seams of the Edmonton area and embodied his findings and conclusions in his well known memoir, "The Edmonton Coal Field, Alberta" (8). Since that time little or no work has been done in the way of continuing the compilation of data and studying the many problems of vital interest to the coal operators of the district.

A quarter of a century of continuous mining in this area has brought to light a wealth of information which the most careful study of the comparatively few coal outcrops of this area could not possibly have predicted.

Numbers throughout the text refer to annotations in the Bibliography.

During the interval methods of mining, markets and quality of product demanded have changed. Of most vital concern to the industry has been the appearance of other fuels, namely gas[†], to compete in a market where coal once reigned supreme.

With these changes in mind, the writer has undertaken to gather together as much information as possible and compile it in a form which may be of some use to the mining industry and to the general public.

Location and Extent of Area

The area investigated extends along the North Saskatchewan river from Big Island (Sec. 33, Tp. 51, R. 25, W. of 4th Merid.) to the Canadian National Railways Bridge, usually known as the Clover Bar Bridge (Sec. 8, Tp.53, R. 23, W. of 4th Merid.) north to the Sturgeon river and some three and one-half miles south of the North Saskatchewan river.

It will be noted that this area forms only a part of the total extent of the Edmonton area as indicated by Dr. Allan on the Map of the Coal Areas of Alberta (1924) published by the Scientific and Industrial Research Council of Alberta. Due to the limited

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[†] Natural gas as a fuel was introduced into Edmonton in 1923.

means of transportation and the fact that the greatest mining activity is centred around Edmonton, this investigation deals largely with an area within a radius of 10 miles of Edmonton, but considers the relationship of the seams to the area as a whole.

Previous Work

As the discovery of coal, explorations, and history of mining will be considered in Chapter II, only the geological investigations in the area will be mentioned here.

Dr. Selwyn, Director of the Geological Survey of Canada (24), made a reconnaissance down the Saskatchewan river in 1874 and noted the character and possible extent of the seams. A much more detailed study of the area was made by Mr. J. B. Tyrrell (25) in 1885 and 1886. It was at this time that the Edmonton formation was named and described. Mention has been made above of Dr. Dowling's work" The Edmonton Coal Field, Alberta", (8).

Acknowledgments

Any merit which this report may have is due to the splendid co-operation of the many members of the mining profession and others, who have supplied information on all phases of the problems discussed.

The problem itself was suggested by Dr. John

A. Allan, Professor of Geology, University of Alberta, and throughout the entire time devoted to it, Dr. Allan, together with Dr. R. L. Rutherford of the same department, and Professor N. C. Pitcher of the Department of Mining, have given invaluable suggestions, criticisms and encouragement.

The writer is particularly indebted to Mr. A. A. Millar, Chief Inspector of Mines for Alberta, and to Mr. J. Richards, District Inspector of Mines, for having made available much of the information embodied here. Mr. Richards' intimate knowledge of the mining conditions of the district gained through many years in the area and his clear insight into the difficulties attendant upon coal production, ~~has~~ have been of the greatest assistance. Mr. Norman Fraser, who has been associated with coal production in the area, has contributed much information in regard to borings, and Mr. W. Wilson, Manager of the Great West Coal Company has helped materially in the compilation of the chapter on mining methods.

The writer's sincere thanks are extended to Dr. A. C. Rutherford who has shown every consideration in placing his splendid library of "Canadiana" at the writer's disposal, and to Miss B. Ockley who has made a careful study of the history of Edmonton.

To all mine operators, miners, 'old timers' and

others who have assisted in any way im this investigation the writer is indeed grateful.

Elevations and Construction of the Map

Elevations quoted throughout the thesis are based on bench marks of the Topographical Survey of Canada and are recorded on the 1926 map of the area published on the scale of one inch equals one mile. It might be mentioned here that considerable difficulty in regard to elevations arose due to three distinct systems being used as ties in the area,-- viz.

- The Topographical Survey Bench Marks established from Geodetic Benches.

The C. P. R. Levels.

The City of Edmonton Levels.

The equation to the Topographical Survey System from the Edmonton City Levels is :

City Level System is 43,006 feet above Topographical datum.

Until as recently as 1930 no mine was required by law to tie in its level system with the Government bench marks. As a result levels from plans of mines abandoned before this date are in many cases derived from contour positions and the proximity of points of known elevation.

Precise levels were run by Mr. L. E. Drummond and the writer to establish definite correlation of

the Clover Bar seam as mined at the Dawson and Red Hot mines.

All of the available mine plans, city plans, reports and boring records have been gone over and the information embodied on the large map on a scale of four inches equals one mile included with this thesis, and the profile section plotted with a vertical scale of one inch equals one hundred and sixty feet and a horizontal scale of four inches equals one mile.

Information, useful in correlation, that was not actually on the lines of sections has been projected to the profile when it was believed that there could be no doubt of the interpretation to be derived being in keeping with the accuracy of the map.

The map is constructed with a view to showing the following information:

(a) General topography and hydrography with reference to the land lines as determined by the land surveys.

(b) Position of drainage systems not now apparent on the surface, which have disappeared by evaporation or other causes but which may be a controlling factor in the lump size of shallow coal seams below.

(c) The outcrops of the various coal seams and their general dip.

(d) Position and extent of workings of the various mines of the map area.

(e) The direction of cleavage or 'cleats' in the mines.

(f) Possible extent, thickness, and economic value of coal throughout the area.

Method of Investigation

The field work was commenced in October, 1932 and continued until snow made work impossible. On the 12th of May, 1933, the writer, accompanied by Mr. D. Taylor, studying the strata other than coal, formed a camp on the river near the Clover Bar bridge and by walking, covered the area and visited the mines from Clover Bar to Edmonton. The fall of 1933 was devoted to work west of the High Level bridge, to Namao, and over the area as a whole.

The information obtained by reconnaissance and from mine plans has been embodied on the map and sections included with this thesis. The map on a scale of four inches equals one mile, was constructed using the following sources of information:

Dominion Land Survey Township Plans.

Dominion Land Survey River Lot Survey - 1883.

Map of the City of Edmonton (Driscoll and Knight).

Maps of the Edmonton District by the Topographi- Survey of Canada on scales of one inch equals three miles and one inch equals one mile.

SUMMARY AND CONCLUSIONS

Ten distinct coal seams in all have been recognized and traced in the Edmonton area. Four of these seams may be considered to be workable seams and of good coal over a considerable area, namely the Clover Bar, Big Island, Weaver and Lower seams, given in the order of their importance.

The Clover Bar seam has been traced with a fair degree of accuracy from Clover Bar to White Mud creek and preserves an average thickness of between 5 and 6 feet. This horizon is also represented as far north as Cardiff and borings indicate that the seam thickens materially to the west of that point, some borings indicating as much as 16 feet of coal.

The Big Island seam is mined at Big Island and White Mud creek but it appears to thin to less than 3 feet at the eastern outcrop. The maximum thickness recorded is 5 feet at Big Island.

The Weaver seam, wherever it has been examined, east of the Dawson bridge, has an outstanding small lump characteristic and hence cannot be considered as a source of fuel for other than the slack coal market. West of the Dawson bridge the

seam produces larger lump coal and has been mined at the Strathcona mine and the old Humberstone.

The Lower seam has been found to underlie the Clover Bar seam through most of the eastern part of the area. It thins to the south of the river to unworkable thickness and observed dips show its basin to be practically co-axial with that of the Clover Bar seam. This seam tends to be gassy but the chief reason for its not having been more extensively worked is its proximity to the Clover Bar seam, only from 27 to 30 feet separating them.

Definite areas of non-deposition of the Clover Bar seam have been outlined and a basin structure recognized over a considerable part of the area. A washout has been traced for nearly two miles to the north east of Edmonton.

More drilling will be required in the area between Edmonton and Cardiff before a definite correlation can be made of the seams mined in these two localities. A more thorough study of the pre-glacial topography will undoubtedly bring to light other washouts and areas of non-deposition of the seams. The tracing of the shore line of the original coal swamp serves to delineate the areas in which commercial coal may be expected to occur.

The palaeogeographical study of coal basins

is becoming increasingly more important. The accuracy with which a coal basin may be traced depends to a very great extent upon the number of accurate bore hole logs available. It is to be hoped that legislation will soon compel drillers to file their drilling records where they will be available for use in geological investigation.

Chapter II

HISTORY OF THE DISCOVERY, EXPLORATION, AND DEVELOPMENT OF THE COAL IN THE EDMONTON AREA.

Introduction.

Little more than a century and a half has passed since the first white man set foot in the area now mapped as Alberta.

The beginnings of a settlement around Edmonton as distinct from 'Fort life' has been within the lifetime of some few living today. The history of the West is not a long one but it moved rapidly. It is the story of far sighted, industrious men and of innumerable hardships.

Despite the relative brevity, many gaps exist in the records. These are due largely to two causes: the non-recording or often improper recording of the events that have had a material bearing on the history of the West, and a lack of appreciation of the historical value of manuscripts that existed in the early days.

The writer has been extremely fortunate in having had access to many first editions of the journals of exploration to be found in the library of Dr. A. C. Rutherford, and in the libraries of the University of

Alberta and the Provincial Legislature.

In tracing the history and later development of the coal seams in the Edmonton area, the subject matter has been divided into three distinct phases:

(1) The discovery of coal and the work of the early expeditions in the region.

(2) The work of the Palliser Expedition and of the Geological Survey of Canada.

(3) The beginning of mining of coal for domestic use and the development of the present market.

The Discovery of Coal and the Work of the Early Expeditions in the Region.

It is felt by the writer that a fitting background for the following of matters pertinent to the history of mining in the Edmonton area is to be found in the history of the discovery of coal in the North West. Mention will also be made of some of the earlier discoveries and explorations in many parts of the province previous to or concurrent with the discovery in the Edmonton field.

The sons of M. de la Verenderye (30) (42) were doubtless the first white men to enter the West. So indefinite are their descriptions of locations that we cannot be sure which branch of the Saskatchewan they took or how they reached the mountains. Whether they

even noticed the coal is not recorded.

It is a question of great uncertainty as to whom the credit for the first discovery of coal is due. Edward Umfreville (48) fur trader, writer and clerk 'at £16 per year" for the Hudson's Bay Company is undoubtedly the first to mention coal, having observed it in 1783. However, it was not seen on the outcrop but as float on the North Saskatchewan river. Having grown tired of the mercenary and unprogressive attitude of the Hudson's Bay Company, he joined the North West Company in 1784, the year of its inception. This was a company into whose ranks later flocked far sighted and courageous men, such as Fraser, Thompson and MacKenzie; each of whom made splendid contributions to the discovery of the North West. It was while with the Northwesters that Umfreville wrote a book in which, after mentioning the float coal, he makes the following generalization:(48) "I am of the opinion that an abundance of this mineral exists in the country about us, as a person once brought me a piece that he had taken from the earth where it was piled up in heaps." Umfreville's locations are indefinite due to his not having had proper observing instruments. However, D. Thompson (33-a) by later locating the position of Umfreville's house fixes it as being near Fort Pitt on the Saskatchewan just east of the Alberta - Saskatchewan boundary line.

Alexander Mackenzie (40) recorded the finding of coal on August 2, 1789, on the banks of the river bearing his name. This information was published in his "Voyages" in 1795 according to Burpee (29). It was certainly recorded in his journals of 1801. It is interesting to note that this coal was burning (due undoubtedly to slow combustion on the outcrops) when first observed. Fifty nine years later Sir John Richardson (44), engaged in searching for the Franklin expedition, came to the spot and found it still burning. It is burning today.

In 1793 Mackenzie while travelling up the Peace River (Lat. 86° N., Long. 120° W.) noted that "There appears a stratum of bituminous substance which resembles coal, though while some of the pieces of it appeared to be of excellent fuel, others resisted for a considerable length of time the action of fire and did not emit the least flame."(40 a). Pitcher(43) considers this to be the first observation of anthracite or anthracitic coal in Canada.

The discovery of coal in the Drumheller area was the result of an exploration trip undertaken by Peter Fidler, Surveyor for the Hudson's Bay Company in 1791. He journeyed south from Fort George on the North Saskatchewan, crossed the Red Deer River, and on his return trip in 1792 stopped at a creek he termed

"Edge Coal Creek"* (in all probability the present Rosebud Creek) where he examined and recorded a large seam of coal exposed in the bank. David Thompson (33-a), Surveyor for the North West Company and geographer of extraordinary energy and accuracy first mentioned the occurrence of coal in the Edmonton area in his report of a trip from Rocky Mountain House down the North Saskatchewan in 1801. The actual site of the discovery was at Goose Encampment on the north bank of the river, about seventy miles West of the present site of Edmonton.

Alexander Henry (33-c), also of the North West Company during the years 1799 to 1814, travelled the North Saskatchewan river many times. To him is given the credit for the discovery of coal in the Saunders Creek area. An extract from his diary on February 10, 1810 is interesting: "I observed on the north side of the river a bank of yellow clay in which there appeared several veins of pure coal of the best quality that I have seen along the river." Henry noticed also the coal seams at Goose Encampment and at Terre Blanche↑.

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* This occurrence is noted along with those of McKenzie on Arrowsmith's map of 1801.

↑ It might be noted that Terre Blanche near the present site of Fort Saskatchewan was the Hudson's Bay Company Fort until 1814, with the North West Company's Fort Augustus near it. In 1814 the Indians destroyed the forts. They were re-established down the river and in 1819 Fort Edmonton was placed just below the site of the present parliament buildings, while the new Fort Augustus

From this time until the coming of the Palliser expedition in 1847 the Edmonton area was traversed by many parties, some with the idea of adventure and hunting uppermost, others taking time to record many of the features of scientific interest noticed in the country. A botanist, Thomas Drummond by name, is worthy of especial note. Drummond was assistant botanist to the second Franklin expedition. He travelled along the Saskatchewan as far up as Edmonton. The magnitude of the privations he underwent may be surmised from the writings of Franklin (37) in his journal of June, 1828. "He had been exposed to great privations, his only equipment throughout the winter consisted of three shirts, a gun, one blanket and a bale of paper for pressing plants,- ... to his perseverance and industry science is indebted for several new and many rare quadrupeds and species of birds and plants."*

David Douglas (25), also a botanist came to Edmonton two years later but little is known of his findings.

Drummond brought several specimens of coal from Edmonton to Sir John Richardson(44) who had studied

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was situated on the present Municipal Golf Links. With the amalgamation of the two companies under the Hudsons Bay Company in 1821 Fort Augustus fell into disuse.

* In all, his collection amounted to 1500 species of plants, 150 birds, 50 quadrupeds, and a number

the coals of the Mackenzie river area. Together they suggested a correlation and placed them both as Tertiary in age. This is, as far as the writer has been able to ascertain, the first mention of the possible age of the Edmonton coal bearing series.

Sir George Simpson (45), Governor of the Hudson's Bay Company, came to the West from England on an inspection trip in 1841. He spent several days at Fort Edmonton during which time he examined the coal seams and wrote descriptions in his journal. His observations were of little scientific value as he greatly exaggerated the thicknesses of the deposits, but he noted the use of the coal in the Fort.

Two other parties will be mentioned; that of the Earl of Southesk, 1859 (46) and that of Lord Milton and Dr. Cheadle, 1863-64, (41). The journals of these two expeditions are interesting, being full of their adventures, hardships, and observations, but they contain little scientific data of any kind.

Southesk's party came essentially to hunt the wild animals of the Rocky Mountains; in that they met with but moderate success. Milton and Cheadle, however, did notice the coal on several occasions and were

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of insects, many of which were later described by Richardson and Hooker.

undoubtedly the discoverers of 'Big Seam' on the Saskatchewan river. They noted, as did Sir George Simpson, that the coal of Edmonton was being dug from the banks of the river and used in the forge mixed with charcoal. The following comment(41) from their journal is worthy of note in that it gives a brief summary of the views held in regard to the areal distribution of the coal measures of the West: "The lignite strata has been observed at numerous points, scattered over more than 10 degrees of latitude, but invariably in the same longitude."

In 1850 the discovery of gold in the Cariboo brought great numbers of people through the Edmonton area. Edmonton was the base at which the parties organized and got their supplies. Many narratives were written of journeys to the West and some mentioned the gold found in the river gravel and the coal that was to be seen in the banks of many of the rivers flowing east of the Rockies.

Of these "Overland to the Cariboo" written by Margaret McNaughton in 1896 is perhaps the most interesting. Writing of the outcrops on the McLeod and Pembina rivers she remarks: "A seam 18 feet thick protruded from the banks of the Pembina river and was visible down stream as far as the eye could reach. The value of this mine, if of the kind of

coal suitable for commerce, within the reach of civilization, would indeed be incalculable. The coal was used for fuel and burned brightly in the camps."

The Work of the Earlier Scientific Expeditions and the Geological Survey of Canada.

The recognition and solution of the major problems of stratigraphical position, geological age, and extent of the coal bearing formations of the West has been in a large part due to the splendid work of the Geological Survey of Canada. More recently the Alberta Geological Survey has done considerable detailed work in several coal areas.

To trace accurately the development, acceptance or discardance of the many theories regarding the coal measures could be as it has been the subject of many theses.

Of one of the problems alone, commonly known as the Laramie Problem, Dawson (4) remarked, "No more interesting problem exists in American geology than that presented by the later deposits of the interior of the continent." It is hoped in the present treatise that a chain of continuity may be developed in regard to these problems, but no effort is here made to produce a critical discussion of the merits of the theories.

The coming of the Palliser Expedition (1857-1860)(18) marks the beginning of the scientific study of the geology, mineral resources, and agricultural possibilities in Western British North America. The scientific personnel of the party consisted of Captain John Palliser, Surveyor and leader of the expedition, Dr. James Hector, geologist, and Monsieur Borgeau, botanist, and Lieutenant (later Captain) Blackiston, in charge of meteorological determinations. The instructions* given to each were definite in their demands and in short, requested that a preliminary yet detailed survey be made, with a view to determining the real worth of the country and the possible existence of passes through the Rockies to the country beyond.

Captain Blackiston went into the Crowsnest Pass and Kootney Pass areas. Captain Palliser concentrated on the country west of Calgary and into the mountains, noting the coal at Canmore and Anthracite, while Hector worked largely in the northern area west of the present site of Edmonton and along the front ranges.

The journal of the expedition was presented to the British Government and published in 1863.(18).

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* These instructions were formulated by Sir Roderick Murchison, Director General, Geological Survey of Great Britain.

Dr. Hector(18) spent some time in the Edmonton area and of his work mention will now be made. He reached Edmonton on December 20th, 1857, from Carlton House on the Saskatchewan. On January 9th, 1858, after a careful study of the outcrops on the river, he described the coal and the associated beds in detail, noting also the fact that the coal weathered badly on the outcrops but improved on tunnelling into the seam.

Two seams were noted, Hector one a 6 foot seam,[*] and above a 4 foot seam.[†] He also noted the occurrence of a "six inch parting of greenish magnesium pipestone clay which works up into a lather when wet and is used by the women in the fort for washing blankets." This is one of the earliest allusions to bentonite in Canada.

Hector undertook the problem of determining the geological age of the coal bearing strata. Meek and Hayden (17) in their work in the Western Central States had recognized the Cretaceous and

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[*] Likely the Clover Bar Seam.

[†] Probably the seam mined under the MacDonald Hotel.

Tertiary and had developed a tentative section based largely on fossil evidence.

Hector considered that the Cretaceous sea had transgressed the central interior plain and he looked to Hayden's section for a correlation. Group 1 of Hayden's section called "the Great Lignite Groups" had been classified as Lower Cretaceous (Dakota), possibly Wealden. In this Hector believed that a correlation could be made on lithological grounds and hence placed the Edmonton coal measures, which he called Series E, as Lower Cretaceous, correlating them with Group 1 of Hayden. He did this with great hesitation for one will recall that Sir John Richardson (44), years before, had suggested a Tertiary age due to the presence of the fossil Taxites, both in the Edmonton beds and the coal bearing beds on the Mackenzie river.

The knowledge of the sediments of the

Hector described his Series E as: "Sandstones, coarse and friable, of argillaceous and concretionary, indurated shales, and soft limestones, ironstone nodules, beds of lignite 3 to 10 feet. Red Deer river; N. and S. Saskatchewan; Athabaska; N. Pembina river etc.

interior plains was greatly advanced as a result of the work of George M. Dawson (4), (5), (6), geologist to H. M. Boundary Commission Survey of 1873-74. The report was written after a careful and thorough study of all the known information on the geology of the West. In the light of our present knowledge Dawson was wrong in his interpretation of the age of the Edmonton coal bearing beds, but his decisions were formed only after the most careful and unbiased considerations.

Dawson showed that Hector's series E could not be Upper Cretaceous (Dakota) as that would assume too great a lithological and palaeontological change in the Dakota from the boundary to the North Saskatchewan. To quote Dawson (4-a): "I cannot find in the report of the U. S. geologists, mention of the occurrence in the Rocky Mountain region or eastward, of beds of lignite or coal in the lower well-marked member of the Cretaceous, comparable with those of the Saskatchewan which are provisionally placed on that horizon by Dr. Hector." He also remarks (4 - b): "At the same time I cannot resist the conclusions that Dr. Hector was right in supposing that some Tertiary beds are included in his division E and it may even turn out that a large portion, or the whole, of this group really belongs to the base of the Lignite Tertiary."

The chief reason for finally deciding upon a Tertiary age for Hector's division E was the absence of Cretaceous cephalopoda and the occurrence of brackish conditions. Dawson explains the occurrence of saurian remains in the beds of division E as the survival of existing species due to the continuation of conditions from the Upper Cretaceous. Dawson did not know that an hiatus does exist between the Tertiary and the Upper Cretaceous as determined by Sanderson (23). Dawson's conclusions in regard to the coal of the interior plain may be summarized as follows:

There are two distinct coal horizons, that of the mountain area which may be correlated with the Dakota or at least with the basal part of Hayden's section, and secondly there exists a horizon which is much younger and is likely early Tertiary.

The findings of these expeditions undoubtedly lent impetus to the early concentration of the Geological Survey of Canada upon the West. The magnitude and accuracy of the early work proved of great importance in the later, more detailed study of the coal horizons.

The selection of a proposed route for the Canadian Pacific Railway through the West caused more than ordinary interest in the possible mineral resources of the country. Sanford Fleming, Engineer in

Chief of Construction, made several trips to the West, carefully noting the occurrences of coal. It is interesting to note that the clay-ironstone bands of the Edmonton formation were looked upon by many investigators as potential sources of iron ore. Possessing both coal and iron, the West would certainly be developed, was the general belief. The first line of location for the transcontinental railroad passed just south of Edmonton, but the slow drifting of American settlers into the southern part of Alberta lead to reconsideration of the original location and the final adoption of the line of route as it is today.

During the period that Edmonton was considered on the route, Dr. Selwyn(24), then Director of the Geological Survey of Canada made a careful reconnaissance from Fort Garry to Rocky Mountain House. It was understood that he should act in an advisory capacity for the selection of the route for the railroad.

Selwyn examined the seams at Edmonton but was not as much impressed with them as with those up the river, which are stratigraphically higher. He evidently did not see the outcrops of the Clover Bar seam as the thicknesses given in his section indicate that only non-persistent seams had been studied. In regard to the age of the Edmonton coal, Selwyn was undecided as to whether they were Upper Cretaceous or Tertiary,

Richardson's findings of Cretaceous coals in the Nanaimo basin, British Columbia, undoubtedly influenced Selwyn to consider the coal at Edmonton to be Upper Cretaceous.

Dr. J. B. Tyrrell in the years 1884, 1885, and 1886, (25), studied in considerable detail the area in present Alberta which lies between the Bow and North Saskatchewan rivers.

He undertook to subdivide the Cretaceous and Tertiary rocks in this area as outlined above, introducing new terms for his subdivisions of the Laramie, namely the Paskapoo and Edmonton Beds. His geological section of the area is given as follows:

	Miocene	
Tertiary		Paskapoo
	Laramie	
		Edmonton
	Fox Hills and Pierre.	
Cretaceous		
	Belly River	

He gives these descriptions of the Laramie subdivisions: (25)

Paskapoo: "Grey and brownish weathering, lamellar or massive sandstones and olive sandy shales. This is an exclusively fresh water deposit."

Edmonton series: "Soft whitish sandstone and white or grey, often arenaceous clay with

> bands and nodules of clay ironstone and numerous seams of lignite. These are of brackish water origin and correspond to the lowest portion of the St. Mary's river series of Dr. Dawson's report."

Tyrrell suggests a gradual contact between the Edmonton and Paskapoo contrary to the later findings of Sanderson, as noted above. Tyrrell places the contact between the Tertiary and Upper Cretaceous at the top of the Edmonton for these reasons:

(1) The flora and invertebrate fauna of the Edmonton resemble that of the Belly River.

(2) The dinosaurs continued up to but stopped at the end of the Cretaceous.

(3) At the end of the Edmonton, a time of great disturbance and mountain building ensued.

Our conceptions of the stratigraphy of the Edmonton area as a whole have not changed in the major part since that time. The thicknesses have been more accurately measured and the unconformity referred to above has been recognized. More recently, palaeontological studies by Russell(21) and others have given the age of the Edmonton as pre-Lance, Pierre at the base, and the rest Fox Hills.

In the spring of 1897, J. McEvoy commenced his work on the section from Edmonton to Tête Jaune Cache (16). He did not contribute essentially to this particular field but concentrated on the areas further west.

The first detailed study of the area was made by Dr. D. B. Dowling in 1909. Dowling had been assistant to Tyrrell in 1886 and thus commenced the work with a very fair knowledge of the section. Two definite traceable coal seams were recognized, namely the Clover Bar seam and an unnamed seam above it. Maps were constructed showing depths to the Clover Bar seam and the positions of bore holes and mines. Since this thesis has for its main object the continuation of Dr. Dowling's study of the geology of this area it is discussed in greater detail in other chapters.

Dr. J. A. Allan (2) studied a section along the Saskatchewan river through the Edmonton area in 1917. He noted a thin shale bed, lying between the Edmonton and the Belly River, which might be Bearpaw. Dr. Rutherford, as a result of extensive studies of the Upper Cretaceous in eastern Alberta, has expressed the opinion that the Bearpaw was not deposited north of the North Saskatchewan river, east of Edmonton.

Several sections of the Edmonton formation have been measured, either by Dr. Allan or under his direction, in the area lying between the North Saskatchewan and the Drumheller coal field.

Mining in the Edmonton District.

Although the journals of the explorers indicate that the existence of coal in the West had been known since 1800 at least, commercial mining did not start for nearly three quarters of a century after this time. True, Dr. Hector with the Palliser Expedition, and Grant, who accompanied Sanford Flemming on his trip to Edmonton, and several others note in their journals that the coal had been mined from the banks of the North Saskatchewan river and used, mixed with charcoal, in the forges at the Fort.

The Indian tribes had on various occasions called the attention of the white man to the smoke issuing from the ground due to the slow combustion of coal seams, but the writer is unable to find record of Indians having used coal as a fuel. MacKenzie, while on his trip to the Arctic, and Milton and Cheadle in their excursion across the plains both note the amazement of the Indians at seeing coal burnt in the camp fires.

The factors of the Hudson's Bay Company at Fort Edmonton had, on several occasions remarked in their reports, on the number of men who had to be employed continuously gathering wood for heating and cooking. That the fort rested on an infinitely more plentiful and much superior fuel, never dawned

upon them except for the occasional experiments in the forge.

Nicholas Sheran opened the first mine in the West in 1872 in the banks of the Old Man river near the present site of Lethbridge. Engraving on the cairn erected in 1928 on the site of the mine speaks for the initiative of the man in trying to create a market. "He broke his own trails and hauled coal by a bull team to a market two hundred miles away." The later history of coal development in Lethbridge and the Lethbridge district is largely the story of the activities of the Gaults, father and sons, in the West.

Rev. George McDougall came to Fort Edmonton as the first settler in 1871, claiming land for his church and for himself, outside the boundaries of the fort. In the next few years many settlers came west and Edmonton grew rapidly. W. G. Ross, an old timer now residing at Fort Saskatchewan states that many people were mining coal for their own use in the banks of the Saskatchewan river by 1874.

There is some question as to whether it was Donald Ross or William Humberstone who started the first mine that might be distinguished from the previous 'gopher-hole' methods. Humberstone came to Edmonton in 1881 and that fall commenced mining in the north bank of the river on River Lot # 20 about 500 feet east

of the present MacDonald Hotel. Work was intermittent depending entirely upon the market. In summer work in the mines was suspended and Humberstone would resort to his brick works on Ross's Flats.

By 1882 according to the Edmonton Bulletin, January 28, 1882, six drifts in all were being worked in a distance of one and one half miles on either side of the town along the river. Dr. Verey and Ed. McPherson employed several miners working an upper seam near where it dips into the river at Groat Ravine. Ross and Moore opened two drifts on the south side of the river and kept a gang of six men working throughout the winter producing coal for the local market. Mr. Walters, who operated a mill in Edmonton for many years, had arrived in a Red River cart from Winnipeg in 1874 bringing with him the first coal burning stove to be used in Edmonton. Mr. (later the Hon.) Frank Oliver bought the stove and became one of Humberstone's best customers, trading merchandise from his hardware store for the fuel. Donald Ross,in advertizing his hotel in the early editions of the Bulletin emphasized,as an added inducement to the transient public and others the extra cheer to be derived from a coal fire.

Barter seems to have been the chief method of doing business. The Honorable A. C. Rutherford, in speaking of his early days in the West,remarked that

he had often accepted coal in exchange for drawing up deeds and other legal agreements.

During 1882 William Deane, D. L. S., made the first survey of the river lots of Edmonton on a scale of 20 chains to the inch. The only coal claim recorded was on the north end of River Lot # 19. Attempts had been made to secure patents on the land where the drifts were situated but the patents were refused on the grounds that it was too near to the town. One firm however pressed the claim of squatters' rights.

In 1882 coal was supplied to the Hudson's Bay Company steamers, for navigation was well organized on the river at this time. It had been proposed that a company be organized to ship coal to Winnipeg but sufficient capital was not forthcoming and the idea was abandoned.

It might be well to consider at this time the conditions at a typical mine. Humberstone's mine was undoubtedly the best developed and in its later stages even boasted of a mine plan. Mining was done on a room and pillar system with two entries driven for ventilation purposes. It is interesting to note that the rooms were driven north and south, not conforming to the main cleavages of the coal which lie N 48° E and N 42° W. Sometimes Humberstone worked the mine himself but in the rush season he hired men

for $13.00 per month and keep. The day varied from eleven to fourteen hours and capacity mining was estimated at ten tons per day.

Due to the indications of settlement of the ground surface in the town as the result of the underground workings Humberstone abandoned his mine in 1902 and went to the Clover Bar area. Here he mined until 1917 when Mrs. Humberstone took over the management. It has been conceded by many mining men that some of the best coal in the area came from the new Humberstone; the seam being nine feet thick in places. It will be remembered that ground settlement due to mining within the city limits again rose as a subject of controversy between the city and the Penn Coal Company not so many years ago.

By 1887 considerable market was developing and an item from the Bulletin of January 7 of that year provides some interesting statistics: "During the past year 1200 tons of coal were mined in Edmonton; of the amount Fraser & Co.'s mill consumed 300 tons; 100 tons were shipped by boat to Battleford, and the remainder consumed in town."

One of the most colorful and enthusiastic characters in the coal business during the early years of mining was Frank B. Smith, Surveyor, Mine Manager, and later Inspector of Mines. In a paper in the Journal of C. M. I. VI, p. 374 (1903) Smith paints an interesting

picture of mining conditions of the time in the area; "Edmonton coal mining, like Edmonton Real Estate, has taken an unprecedented boom, not unprecedented to the inhabitants of that city but certainly to the ears and eyes of the outside public. The whole surrounding country is underlaid by strata of coal varying from 2 feet to 12 feet in thickness. Altogether there are about thirty independent operators within a radius of twenty miles, each of them producing from three to thirty tons per day. The coal is lignitic in nature,- very suitable for domestic purposes and stationary boilers. The great stir in railway circles is no doubt the cause of all this activity, and as soon as a transcontinental road penetrates the country, these numerous small mines will be closed down and coal mining will be carried on more extensively by two or three companies operating large areas."

In consulting the reports of the Department of Public Works of the North West Territories for the year 1903 the writer has found records of twenty two mines in the district. There may be two reasons for this discrepancy, -- the natural optimism of Smith, and the fact that mines were not required by law to be registered as yet. The numbering of mines did not begin until 1906.

The coming of the railroads to Edmonton;

the C.P.R. from Calgary in 1903, and the G. T. P. in 1909, lent greatly to the spread of the market for Edmonton coal. The many towns as far as the Eastern Saskatchewan boundary were buying this fuel.

It would be tedious to trace the growth of individual mines in a resume of this sort but suffice it to say that the number of mines and the tonnage produced increased greatly in the next twenty years. This is to be expected with the growing population of the city and the surrounding towns. The following are the mines that were operated in 1908 and are still producing coal: Ottewell; Byers Brothers (now Fraser-MacKay); The Western: Shermann Miller; Manders; Keith and Fulton; and Dawson. The Western, the Shermann Miller and the Manders are today mined as the Black Diamond Mine.

Methods of mining are strictly controlled by legislation known as the Alberta Mines Act, the compilation of which has been due largely to the observations of mining men and inspectors throughout the province. How a serious disaster in the Edmonton district added to these regulations is worthy of note. In 1907 a fire broke out in the surface buildings of the Strathcona Mine, situated near the south end of the High Level Bridge. The fire spread to the shaft and six men lost their lives. Since that time the Mines Act has specified that mines must have two shafts at least one hundred

feet apart.

Accidents have been few in the area due possibly to the small amount of gas encountered in mining. The lower seam of the Standard mine is the only one in which there is a record of gas having been found in any quantity.

The consolidation of mines has been suggested at intervals since 1900. With the coming of gas as a competing fuel in 1923 the subject was revived; but as yet, with the exception of some combined advertising, little has been done. Consolidation may come in time.

In fifty years of mining in the district there have been many changes. Various methods of mining, such as stripping, room and pillar, and even advancing and retreating 'long wall' have been attempted. The room and pillar method is the one most generally used, but modifications of the 'long wall' method have recently been tried with considerable success in several of the mines. Coal cutting machines have been introduced and mine plans have been greatly improved. Since 1931, mines have been obliged by law to tie their elevation traverses to government bench marks. Without these elevations, correlations of seams over any distance is practically impossible. In the development of this thesis elevations recently determined by mining companies have made the correlation of seams over a considerable

extent of the Edmonton area possible.

This is a sketchy history of mining in a small part of a great coal area; lack of time and a scant knowledge of many details has prevented the writer from doing full justice to a subject of great interest.

Chapter III

STRATIGRAPHY

The Upper Cretaceous and the Quaternary are represented by the rocks and unconsolidated sediments of the Edmonton area. The representative rocks of each period differ considerably lithologically; the Upper Cretaceous sediments are arenaceous to bentonitic sandstones and clays, ironstone bands, and coal seams, while the Quaternary deposits are unconsolidated sand and gravel beds, alluvium and glacial debris. The contact between the two series is distinct and undulating due to the eroding action of the continental ice sheet which covered the area in Pleistocene times.

The Quaternary beds considered in a descending order are as follows:

Alluvium and Outwash.

Due to the meandering course of the North Saskatchewan river, no less than seven flood plains have been developed within the area. They are extremely flat and lie at elevations of not more than 35 feet above the present river bed. Although in the lower parts there is considerable gravel, it grades upward into silts and clays formed from the wind and stream erosion of the Edmonton

formation and the glacial deposits. The concentration and uniformity of size of the material of the river gravels has resulted in their being of considerable economic value for surfacing of highways. These deposits are shown in yellow on Map I. A quarter of a mile north of Clover Bar, several gravel pits have been opened. The pit lying one and one-quarter miles north of Clover Bar is undoubtedly the largest. The council of the City of Edmonton had the area in Sec. 26, Tp. 52, R. 24, W. of 4th, prospected.. Extensive deposits of fairly uniform gravel were found but estimates of the extent of the beds were not made.

Periodically since about 1860 the gravels have been prospected and washed for gold which occurs in fine particles in the river gravels.

The flood plain clays have been used for many years in the manufacture of bricks for the local market. Ries and Keele (29) give a thickness of not less than 10 feet for the workable deposits. Due to the large amount of sand in the material, a poor quality of brick is produced, the tensile strength rarely exceeding 215 lbs. per square inch.

Glacial Deposits

The greater part of the map area is mantled with glacial material ranging in thickness from 20 feet to nearly 85 feet in places. It is considered

by Mr. D. A. Taylor to be partially of lacustrine deposition, the lakes having been formed after the retreating of the continental ice mass.

Yellowish brown in color, the typical glacial till shows a distinct columnar structure in many places which tends to the production of vertical cliffs along the river. Gravel and sand deposits are found between the glacial till and the Edmonton formation in many places, such as the west side of Dowler's creek; on the north bank of the North Saskatchewan river at the Bush mine; on the east bank just south of the Clover Bar bridge and just above the coal outcrop in the south bank of the Saskatchewan, north of the University campus.

Mr. D. A. Taylor has concentrated upon these particular phases in his thesis "The Detailed Stratigraphy of the Edmonton Area" and hence no further reference will be made to the glacial deposits in this work.

The Edmonton Formation

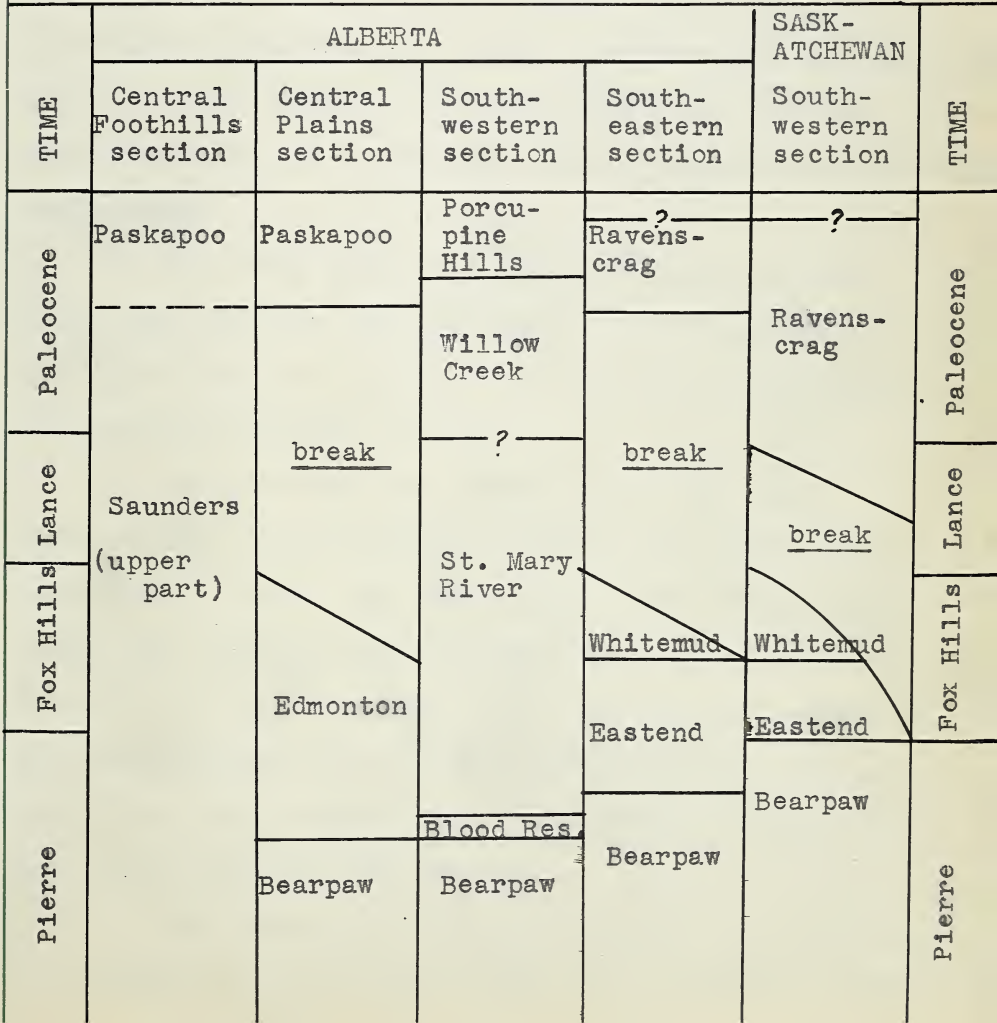
The Edmonton formation was described by Tyrrell (25) in 1886. Lithologically it consists of light colored bentonitic clay beds and bentonitic shales with very few sandstone members. Two distinct major coal horizons exist, one near the top and the other near the bottom of the formation. Clay -ironstone

nodules form characteristic bands in the formation and seams of pure bentonite as thick as 18 inches have been seen in the banks on the north side of the river just west of the Standard mine. The Edmonton is considered to be mainly a brackish water deposit and possibly marine at the base, being laid down after the Bearpaw sea retreated to the south east. In an effort to detect the presence of any vestige of salinity in the waters of the swamp in which the coal was formed the writer endeavored to get tests for soluble chlorides in pieces of coal from various parts of the area. The samples were each boiled for an hour in distilled water. Another set of samples was boiled in dilute acid and still another in alkaline solution. The solutions were then filtered and treated with $AgNO_3$ to precipitate the chloride. Negative results obtained seem to indicate that the coal was deposited under fresh water conditions, or that the chlorides have been completely leached out. The latter assumption seems improbable.

Since the first study of the Edmonton Coal horizon by Hector, its age has been a subject of great controversy. Russell(21), studying the fossil fauna of the Edmonton formation, has considered it to be Upper Cretaceous and to represent the later stages of the Pierre at the base and the remainder to

be correlated with the Fox Hills of the Western United States. The vertebrate fauna indicates that it is definitely pre-Lance.

The following table reproduced from Russell's paper (21) "The Cretaceous and Tertiary Transition of Alberta" gives the relationship of the Edmonton to other Upper Cretaceous formations of Alberta.



TIME	ALBERTA				SASKATCHEWAN	TIME
	Central Foothills section	Central Plains section	South-western section	South-eastern section	South-western section	
Paleocene	Paskapoo	Paskapoo	Porcupine Hills Willow Creek ?	? Ravenscrag	? Ravenscrag	Paleocene
Lance	Saunders (upper part)	break	St. Mary River	break	break	Lance
Fox Hills		Edmonton		Whitemud Eastend	Whitemud Eastend	Fox Hills
Pierre		Bearpaw	Blood Res. Bearpaw	Bearpaw	Bearpaw	Pierre

The Thickness of the Edmonton Formation

The thickness of the Edmonton was first given by Tyrrell in 1886 as 700 feet. Later determinations by Dr.J.A.Allan(1), who measured a section in the Red Deer valley record a thickness of 1, 124 feet. Rutherford (22) in discussing the geology of the area between the North Saskatchewan and the McLeod rivers estimates the thickness in excess of 1000 feet. The bore hole at the Edmonton Power Plant and that on the north side of Jasper Avenue near 98th street indicate that the Edmonton formation at Edmonton city is between 350 and 400 feet thick.

The coal mined in Edmonton belongs to the lower coal horizon near the base of the formation as distinct from the "Big Seam" on the North Saskatchewan which is in the upper horizon.

At least ten persistent seams have been noted in the area to which the writer has given both numbers and names. The names such as the 'Clover Bar seam', the 'Weaver seam' and the 'Lower seam' and the 'Big Island seam' are used since they are in common use among members of the mining profession of the district. These seams will be discussed in detail in the second half of this chapter.

The ironstone bands had attracted the attention of prospectors in the early days as a possible source of

iron ore. Dr. Selwyn, Director of the Survey, while visiting Edmonton in 1874, commented upon them from that standpoint. He concluded that due to the small quantity of the material available and the very small percentage of metallic iron which could be derived from them, any effort to produce iron commercially from this source would be useless.

The writer considers the ironstone bands to be due to the concentration of iron hydroxide in layers in the swamps during the period of deposition of the formation. This hydroxide is turned slowly to oxide upon drying and consolidation of the sediments. The present nodular form is entirely a surface phenomenon. The bentonitic content of the iron bearing clay causes concentric shrinkage about any firm object such as a leaf or twig, if layers of the moist iron clay are allowed to dry. Upon digging into the bank it was observed that the ironstone nodules become softer and eventually disappear. Upon further excavation, only sticky iron-bearing clay in uniform bands is seen, with no suggestion of a nodular structure.

Bearpaw Formation

Evidence from bore hole logs and the character of the Bearpaw to the east seems to indicate that the Belly River underlies the Edmonton, in this area. Dr. Allan (2),

in studying a section along the North Saskatchewan ? river found a very thin shale member, lying between the Edmonton and the Belly River near Fort Saskatchewan, which he classified as possibly Bearpaw. Rutherford, as the result of further field work, has considered that the Bearpaw was not deposited on the north side of the North Saskatchewan river on the east side of the Alberta syncline. Dowling,(57d) in commenting upon the log of the well bored on the north side of Jasper avenue, decided that the 6 foot seam struck at 1440 feet (725 feet above sea level) was undoubtedly in the Belly River. Examination of the log of the Fairholme well (Sec. 30, R. 23, Tp. 52, W. of 4th,) although the lithology is poorly described, does not indicate any dark shale which might be considered Bearpaw.

STRATIGRAPHY

Part II

Description of Coal Seams

The seams occurring in the Edmonton district have each been given a number, the oldest being called "No.1" and the youngest "No.10". Names are also assigned when they are considered to be in sufficient general usage among members of the mining profession to warrant their adoption.

Three seams have been extensively mined throughout the area. Others have been prospected and worked only in small areas.

Seams No. 1 and No. 2 are known from borings only. They have never been worked due to their depth below the surface. Dowling's information indicates that the seam here designated as No. 1 was found in the well drilled on Jasper and 98th Street at an elevation of 1750 feet. The seam was reported to be 8 feet thick. No analyses were made from the borings.

Number 2 seam has been encountered in the drill hole mentioned above at an approximate elevation of 1820 feet above sea level. The coal is 8 feet thick. The drill hole at the Edmonton Power Plant,

drilled in 1906 indicates this seam with a thickness of 3 feet at 1833 feet above sea level. The pavement is sandstone and the top is hardpan according to the log of the well at the Power Plant. Here again no analyses are known to exist.

No. 3 Seam or the "Lower Seam" is found to persist over a great part of the area. It outcrops as a 2 foot seam at river level in Sec. 28, Tp.53, R. 23, W. of 4th, and is found lying from 27 to 34 feet below the Clover Bar seam in many borings and mine shafts throughout the area. Its thickness runs from 10 inches to 5 feet and seems to have been deposited in a basin of similar shape to that of the Clover Bar seam, since they both appear to thin in the same localities and in the same directions. It occurs in the Ottewell mine and Black Diamond mine as 2 foot seams approximately 30 feet below the Clover Bar seam. It was found in the excavations for the Clover Bar bridge piers and reported to be 2 feet in thickness. It is possible that the 6 foot seam worked in the Kent Mine is the Lower seam and the 5 foot seam 22 feet above is the Clover Bar seam. Drillings in the Red Hot mine disclosed the Lower seam at a depth of 28 feet below the Clover Bar seam with a thickness of less than a foot. It thickens rapidly to the north and west as it is from 4 feet to 5 feet thick under the Standard mine across the river.

The Lower seam was worked in the Parkdale, Standard and Ritchie mines. There was considerable gas found associated with the seam and its proximity to the Clover Bar made cavings into the upper seam ? dangerous.

This seam thins to the north of the Parkdale but not as rapidly as does the Clover Bar seam. On the south side of the basin the thinning to the south is apparent. At the Red Hot it is less than 1 foot thick, at the Dawson it is 2 feet 5 inches and reported to be ? good coal. In the Twin City mine this seam was worked for a short time, the thickness being nearly 5 feet, but a 6 inch bone parting is found 2 feet from the clay floor. The seam thins rapidly to the south in this mine.

In general the seam is thickest around the area of the Old Penn and the Standard mines, thinning to the south and the north. There is a 5 foot seam lying between 50 and 65 feet below the Clover Bar seam shown in the city drillings on the Gibbons property, south west of the Mayfair Country Club. This might be considered to represent the Lower seam horizon. This seam has not been mined around Clover Bar due to its thickness being less than 4 feet over that part of the area.

Elevations indicate that the 5 foot seam that ? the Deep Seam Coal Company started to mine is the Lower seam rather than the Clover Bar seam as was

assumed by the company. This seam generally has a clay roof and floor. Analyses are not available for this seam.

No. 4. The Clover Bar Seam

The Clover Bar seam has undoubtedly the greatest extent of any seam in the area. It thins out to unworkable thickness in places but is on the average from 4 feet 5 inches to 6 feet. The Clover Bar seam horizon, if not the actual seam, extends as far north as Morinville. To the west of this town drill holes have indicated a material thickening of the seam. A seam of 12 feet has been recorded.

The Clover Bar seam has been traced by bore holes from the outcrop as shown on the large map to St. Albert. The thickness is 7 feet in the vicinity of St. Albert.

From Clover Bar to Mayfair a definite basin structure has been recognized and will be described in detail later. The coal thins to the edges of the basin but is as much as 7 feet thick in the centre of the basin.

The Humberstone mine, considered to be in the centre of the basin, has 7 feet of coal which is dull rather than lustrous. No partings of any size are seen in the coal in this mine. The Marcus, Ottewell and Fraser MacKay mines show a slight thinning but the coal is still of the dull lustre variety. South of the

river except around the Kent mine where this seam is 6 feet thick the coal thins materially. This is indicated by the appearance of bone and clay partings which increase in thickness to the south. This feature is seen in the Red Hot, Frank, Dawson and Twin City mines. The Chinook, Penn and Parkdale mines show a thinning to the north. In all of these mines the coal has a banded structure being alternately lustrous (vitrain) and dull (durain).

Analysis of coal from this seam has shown that a gradual increase in calorific value from 12,700 B.T.U.'s (calculated on a moisture and mineral matter free basis) for the eastern mines up to 12,950 B.T.U.'s in the area between the Dawson and High Level bridges.

The ash is usually between 6 and 8 per cent with occasional analyses running as high as 9.5 per cent.

The percentage of moisture in the coal decreases slightly from the eastern part where it is between 25 and 26 per cent to the west around the Dawson bridge where it averages from 24 to 25 per cent.

The cleavage is distinct in two directions, the major cleavage being at N. 48° E. and the minor cleavage at right angles to it.

Curly coal (see frontispiece) occurs in this seam in many of the mines in the eastern part of the area in layers up to 2 feet in thickness. This coal

has a peculiar hackly fracture. It may be due to the plant debris having been carbonized or leached out before it became buried as peat. This carbonization may have been due to the action of forest fires in Cretaceous times or to sudden lowerings of the water levels in swamps allowing accumulated debris to dry out before being covered. "Curly" coal makes a good fuel and is preferred by many coal users.

Seam No. 5 is a persistent thin seam, seldom over 3 feet in thickness, which is found about 35 feet above the Clover Bar seam. It has not been mined. It outcrops along the river from about 400 feet west of the Low Level bridge where it is seen at water level, to the bend at Clover Bar. It can be traced quite definitely but does not vary greatly from 2 feet thickness. It is shown on the bank of the river.

The coal seems to weather well and is dull black in color. The cleavage is not as pronounced as in the Clover Bar seam. No analyses have been made of this seam to the writer's knowledge.

Seam No. 6

This seam has a thickness of less than 2 feet at all places where it has been observed. It is not sufficiently persistent or distinct in characteristics to be useful as a horizon marker. It is seen in the section on the river bank at the Bush mine and again near water level at the Dawson mine, and can be traced through

the intervening area with a fair degree of accuracy. It has no commercial importance.

Seam No. 7. The Weaver seam

This seam varies in thickness from 6 inches to 6 feet. Its chief characteristic is that in nearly every instance where it is recognized the coal is in small fragments, -- never more than 2 inches in diameter. Weaver and Clarke opened a mine in this seam on Fulton creek where it is 6 feet thick. The drift was driven in over 60 feet and the coal still maintained its small lump characteristics. The seam outcrops in the valley at the Red Hot mine with a thickness of 2 feet and again on the hill above the Dawson mine. It can be traced along the high banks on both sides of the river up as far as the High Level bridge.

This seam lies stratigraphically about 120 feet above the Clover Bar seam. To the west this coal is less fractured and has been proven to be a good source of commercial coal. The first Humberstone was a drift in this seam, 400 feet east of the MacDonald Hotel. The seam mined by the Strathcona mine is thought to be the Weaver seam. In this mine the roof and floor were bentonitic clay.

As a possible explanation of the small lump nature of the eastern part of this seam it might be

suggested that as this seam was close to the surface in the eastern part during the glaciation, the mass of ice and the associated drainage would undoubtedly have greatly affected it.

Analyses show that this coal has a high calorific value, being as high as Big Island coal.

Seam No.-8.

This seam is non persistent, being found only in the area from Laurier Park to the bank opposite the mouth of White Mud creek.

The seam is 3 feet 6 inches thick in the bore holes put down by the city in Laurier Park and about 3 feet opposite White Mud creek.

Seam No. 9. The Big Island Seam.

This seam is persistent over a large area, being mined at Big Island, and the south end of White Mud creek. It is seen to outcrop along the river at intervals down to the High Level bridge where it appears as a 2 foot seam at the top of the Strathcona Mine shaft.

The coal is a good lump coal and tends often to have small particles of resin included in it. At Big Island and at White Mud the seam is between 5 and 6 feet thick and with a clay floor and roof.

Analyses of this coal show it to have a higher calorific value and less moisture than the

Clover Bar coals. The average of several samples gives a calorific value of 13,200 B.T.U.'s on a moisture and mineral matter free basis, and percentage moisture ranging from 22 to 24 per cent.

The Big Island seam lies about 280 feet above the Clover Bar seam.

Seam No. 10

This seam has not been mined although in places it is 3½ feet thick and fairly good coal. It lies about 50 feet above the Big Island seam and may be seen close to the tops of the banks near Big Island. It does not outcrop on the White Mud creek as far as observations have indicated. No analysis of this coal is known.

Chapter IV.

STRUCTURE.

The structure of the Edmonton coal area is discussed from three standpoints: the general structure of the area, the basin structure, and lastly those phases of deposition and erosion which cannot be properly classified as strictly structural phases but which, nevertheless, have a considerable bearing in indicating the areal distribution of the commercial coal measures.

General Structure.

The Edmonton coal area lies on the eastern limb of the Alberta syncline, that great area of past deposition which can be traced as a structural identity for at least four hundred miles with its axis roughly paralleling the Rocky Mountains. The dip of the strata in the Edmonton area has been determined to be from 11 to 32 feet per mile in a general direction of S 75° W, and striking N. 15° W. The dip is slightly greater at the eastern edge than at the western edge of the area. The various seams appear to parallel one another with remarkable uniformity. The slight variations in the dip will be discussed in connection

with the basin structure.

The Basin Structure.

By the term"basin structure" is meant a present areal distribution of coal and arrangement of dip which owes its thickness of sediments at the centre and thinning to the sides,to the existence in Cretaceous times of a swamp bounded by low-lying shore lines and with sufficient associated vegetation to have filled these depressions with the material which has gone to make the present coal.

The recognition of the basin structure in the Edmonton coal area and the reconstruction of the boundaries of this basin has presented one of the greatest individual problems of this work. It is needless to say that the actual position of the pre-existing shore lines has been determined with much greater accuracy in those parts of the area where the lateral changes in coal seams are best known. Generalizations regarding the basin have been drawn by the application of existing knowledge of coal deposition to the facts which have been determined by exploitation and prospecting of seams. On two occasions predictions by the writer in regard to the character and position of coal in hitherto unprospected areas were substantiated by subsequent borings by mining companies.

As the Clover Bar seam has the greatest lateral extent and has been more widely prospected than other seams this discussion is particularly applicable to it, but it serves to give a picture of the conditions which are quite probably applicable to the other seams as well.

The basin plan is roughly"dumbbell-like" in shape, being less than 2 miles wide at the narrowest point and increasing to over 5 miles in the widest part,where the boundaries of the basin could be accurately determined. The long axis is in a north-east, south-west direction, from the Dawson bridge past the new Humberstone mine. The basin is cut off along the north-eastern part by a washout discussed below, which makes the actual boundaries of the pre-existing swamp in this particular part of the area difficult to reconstruct. Various aspects of the coal lead to the assumption that the eastern boundary extended beyond the eastern outcrop of the seams.

Following the shore line from the outcrop in a westerly direction, the northern boundary is indicated to have existed as drawn on the map from a point about 400 feet north of the Parkdale mine across the city of Edmonton to about the corner of 104 Street and 107 Avenue. Lack of information of any sort on the character of the coal just west of this point makes prediction in regard to the continuation

of the shore line in this direction impossible. On the south side the shore line can be traced forming a long narrow projection into the swamp as indicated on the map in sections 35 and 36 of Tp. 52, R. 23, W. of 4th, and through River Lots 37 and 39. It is known to have crossed the present position of the river and continued for some 200 feet north. It then follows in a westerly direction, lying not more than 5/8 of a mile south of the south boundary of the Twin City Mine.

The reasons for these assumptions in regard to the shape and extent of the basin are discussed under the following headings:

(1) Variation in the dip.

(2) Indications of shore line conditions.

(3) Change of lustre of the coal.

(1) Variation in the Dip.

Dips recorded in mines and the following of outcrops have shown that, in addition to the general dip of the strata as indicated above, there are also local fluctuations which tend to converge inwards towards a definite line which is assumed to be the axis of the basin. At the Kent coal mine (on the crest of an anticline) the coal dips to the north west at about 15 feet per mile. In the Black Diamond mine the dip is at about 30 feet per mile in a direction S 15° W. Following northward through the Marcus,

Fraser MacKay, and Ottewell mines the dip appears to swing slightly to the west, i.e. at about 30 feet per mile in a direction of S 20° W. The dip in the Beverly mine and in the Clover Bar mine was to the south in a direction of S. 25° W. Coming further west to the Chinook, Old Penn, and Parkdale mines the dip has swung around until it is now at about 20 feet per mile in a direction of S 10° E. At the southern end of the Chinook the coal is practically horizontal. This condition is also seen in the Dawson mine to the south of the Chinook. There the coal is nearly flat at the shaft but at the southern end of the workings it dips at about 20 feet to the mile to the shaft, i.e. to the north. In the Twin City mine the dip is to the north in the direction of N. 25° W. The mine plans state the dip to be 1 foot to the hundred feet but this seems to be an exaggeration. At the Red Hot Mine the dip is to the north east in the direction of N. 20° E. It will be readily seen, by noting the position of these dips as marked on the map, that they tend to delineate a definite synclinal or basin structure and that the river lies fairly close to the axis in the area from Clover Bar to the High Level Bridge.

(2) Shore Line Conditions.

An approach to shore line conditions is manifest by a gradual but distinct decrease in the

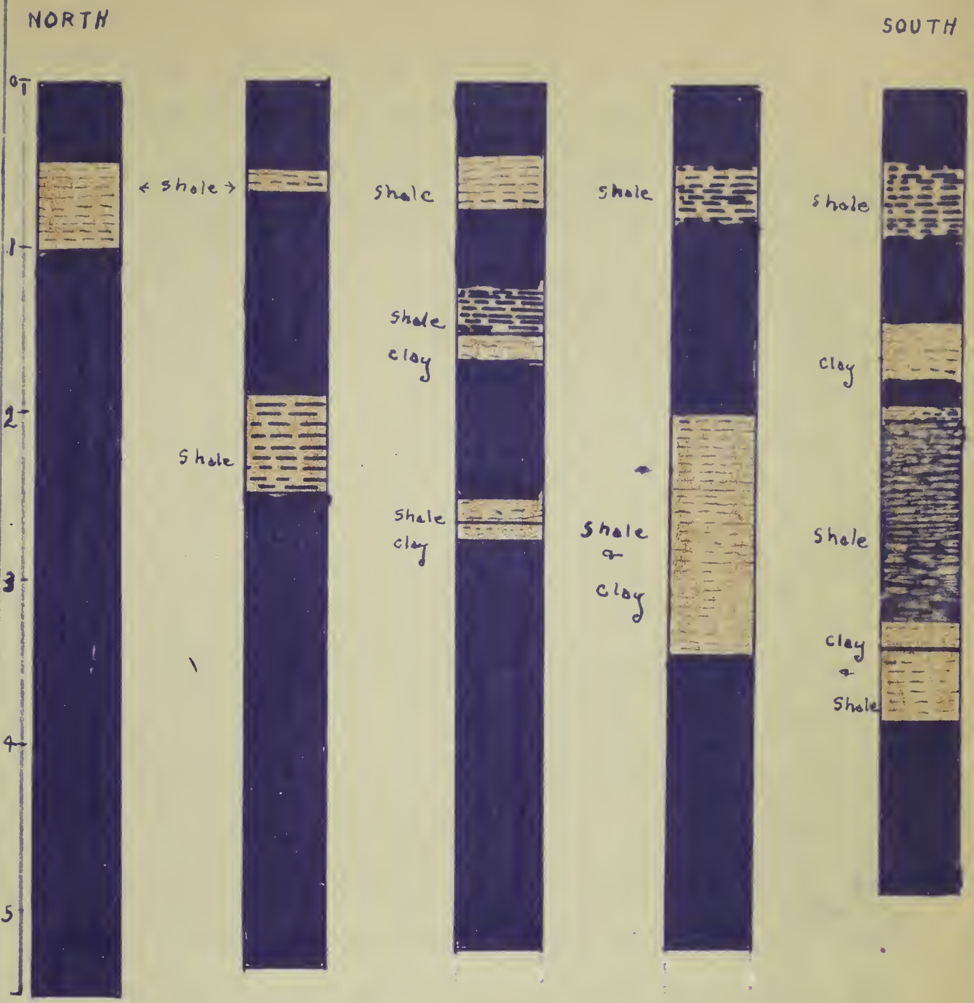
thickness of the coal as mined or prospected and a corresponding increase in the thickness of the bone beds and clay partings in the seams.

Over a period of years the shore line of the swamp tends to change. The amplitude of the fluctuations of the shore line now marks the area in which the appearance of partings will be seen. If the shore line has receded from its previous position deposition over the area which it now covers will tend to produce a thin seam by comparison with the thicker deposits of the central part of the basin. These conditions were looked for and found in many of the mines and when this information was compiled upon the map it served to indicate a swamp condition which was practically identical with that suggested by the previous discussion of the dip.

Passing northward from the Chinook through the old Penn mine to the Parkdale the actual thickness of coal decreases from 5 feet 6 inches to less than 2 feet 1 inch at the northern boundary of the Parkdale, and the bore hole 400 feet north of the Parkdale indicates that the coal has a thickness of less than 2 feet. This decrease in the thickness of the coal is really due to the increase in the thickness of the bone beds which are looked upon as tongues of deposition formed during the fluctuations of the shore line. On the southern part of

the basin this condition is again seen in the Twin City mine. Fig. 2 showing sections of the seam about 350 feet apart in the Twin City mine from north to south indicates a similarity in conditions to those described above. This condition is also seen in the Red Hot mine and borings by the owners of that property on the southern boundary of River Lots 33 and 37 have shown the coal to have decreased from over 5 feet to less than 2 feet, and possibly not more than 1 foot. The barren area, reaching into the swamp, which may prove to be an island or deposits formed by a stream flowing in the swamp, has been outlined by these bore holes and that by Weaver in the N. E. quarter of 36, 52, 23, W. of 4th, which showed the coal to be less than 1 foot and a half in thickness. The presence of this barren area is further indicated by the rapid thinning of the coal from the shaft of the Bush mine to the west and to the south. At the shaft of the Bush it is about 4 feet but a prospect by Fulton at river level on the northern end of River Lot 45 has shown this coal to have decreased to 2 feet 6 inches.

The area of greatest deposition is considered to be around the western boundary of the Humberstone property where the coal reached a thickness of over 7 feet. Thinning occurs in all directions from this



These sections are approximately 350 feet apart.

Fig. 2 Sections from North to South of the Clover Bar seam in the Twin City mine, showing the thinning of the coal to the south indicating the proximity to the southern shore line of the basin.

Drawn by H. H. Beach.

point. The coal through the Fraser MacKay and Black Diamond is uniformly between 5 and 6 feet but tends to thin slightly to the west and south-west. A curving to the south of the axis of the basin is indicated by the fact that the coal in the Kent mine is over 6 feet in thickness, but to the west of this mine the coal will undoubtedly be found to gradually thin out. The remarkable lack of bone beds of any appreciable size in the central part of the area serves to justify further this theory.

(3) Relationship of Change in Lustre to Basin Structure

A considerable amount of information has been accumulated, particularly by White in his epic work, "The Origin of Coal" (68) and by Dachnowski of the United States Department of Agriculture to indicate that there is a definite zoning of the vegetation considered from the centre to the shore line of a swamp. Other than the recognition of this fact, there seems to have been little if any consideration given to the manifestations of this zoning in the texture and lustre of the coal seam representing those phases from the centre to the boundaries of the basin. Plate 2 (after Dachnowski, from W. T. Thom, Jr.'s book "Petroleum and Coal" 1929) shows the gradual encroachment of larger forms of vegetation over a swamp as it becomes filled. MacVicar(15) in discussing Davis's

Plate No.3

Sketches illustrating stages in filling of a depression by peat materials. (After Dachnowski, U.S. Dept. of Agric.)

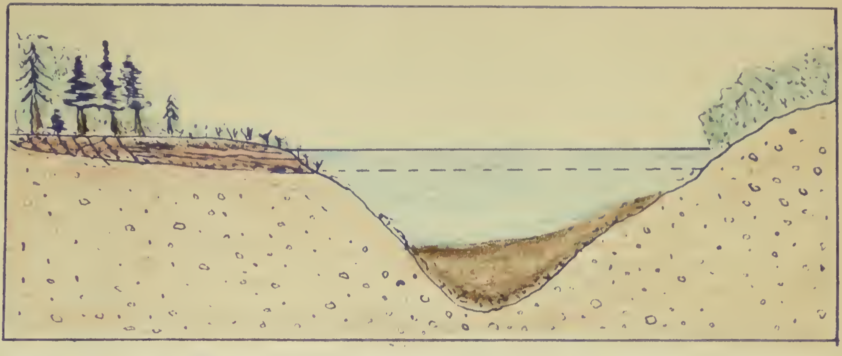


Fig.1. Showing the accumulation of finer organic sediments in the swamp bottom.

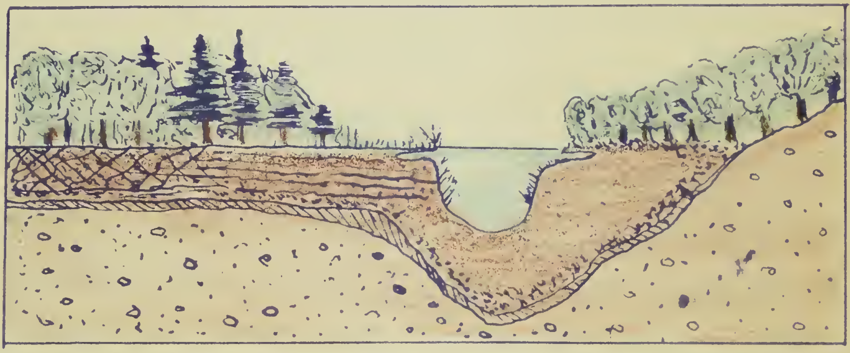


Fig.2. Showing the gradual closing of the swamp due to the ingress of larger stump growth.

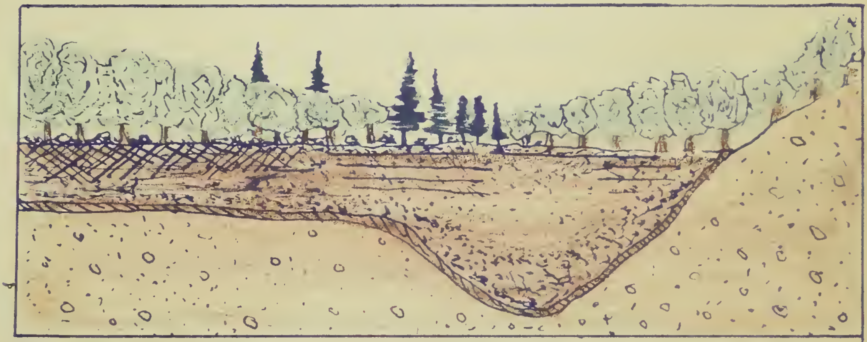


FIG. 3. Showing the final closing of the swamp, the larger trees having grown completely over it.

interpretation of the zones of vegetation around swamps has considered the existence of the following definite zones from the centre to the shore line:

(1) Chara and floating aquatics.
(2) Pond weeds.
(3) Water lilies.
(4) Floating sedges and moss.
(5) Small plants of the conifer and shrub type.
(6) Shrubs and sphagnum or peat moss.
(7) Tamarac and spruce.
(8) The marginal fossa.

It will be noticed in the consideration of the characteristic plant type of each zone that the stumpage materially increases as the shore line is approached. Hence one would expect to find that the coal formed from the material deposited in the centre of the basin will differ in texture from that deposited close to the shore line.

In the Edmonton area, the writer has found very little evidence of large, woody stemmed plants in the coal near the centre of the basin. The coal is uniform, dull of lustre, and not particularly banded. Near the shore line the forms of large plants of a woody nature can be seen in the structure of the coal, lending a distinct banded appearance. A lump of coal

taken from near the shore line shows alternate layers of glossy coal (vitrain) and dull coal (durain). After examining a considerable amount of the lustrous phase of this coal the conclusion is reached that there can be no doubt but that these bands are the greatly pressed remains of single branches, because they are elliptical in cross section and at times have shown definite wood cell structure on their longitudinal section.

It seems reasonable, therefore, to assume from observations and the above reasoning that the duller, more uniform coal has been deposited in the central part of the basin and that banded alternately bright and dull coal is typical of conditions closer to the shore line. This has been borne out by examining the coal of the mines which are situated both at the centre and near the boundaries of the basin as has been delineated in Sections 1 and 2 of this discussion. In the Beverly mine, assumed to be near the centre of the basin, the coal is dull with only the occasional small stringer of lustrous coal. However the foot of coal closest to the roof and separated from the remainder of the seam by a 1 inch clay band is particularly lustrous, indicating a profusion of large stumped growth. This is in keeping with the fact that the larger stump growth tends to encroach over the whole of the swamp in its last stages.

This condition is also characteristic of the coal in the Clover Bar and Humberstone mines. The Parkdale, Twin City, Dawson and Red Hot mines, situated near the boundary of the basin, have a very lustrous coal by comparison with the Beverly, Clover Bar and Humberstone.

Hence it is logical to assume that the lustre of the coal will be a material factor in determining in which part of the basin any particular mine is operating.

Washouts.

A washout is that portion of a coal seam which has been removed or washed away and its place filled with sand or gravel.The terms 'nip' and 'area of want' are also mining colloquialisms applied to this feature. A washout is not a structural phenomenon but is the result of erosion of the coal by a post depositional drainage system.

A very definite washout occurs in the Edmonton area. It runs practically due west from the Clover Bar bridge and is 1 ¼ miles wide at this point. The south eastern boundary has been traced from the river to where it forms the northern boundary of the workings of the Clover Bar mine and is again seen in the northern part of the Beverly mine, three quarters of a mile to the west of the Clover Bar. The northern boundary of

the washout has been traced by bore hole which reported river gravel material but no Clover Bar seam at the depth at which it would ordinarily be found. The bore hole in the centre of this area at the creosoting plant did not strike the Clover Bar seam at the expected depth.

No indication of the washout is given on the surface. An examination of the gravels from it shows them to be largely of quartzite and chert pebbles, rather than those of granitic and gneissic composition associated with the glacial deposits. It seems logical to assume that the washout occurred before the glacial period, which has tended to fill in and so change the valley like topography, which must have been associated with the washout, that it cannot now be traced on the surface.

At the present time the Riviere Qui barre flows into the Sturgeon at right angles to the latter. Underground factors tend to indicate that this drainage may have continued at one time across the northern part of the city and joined the North Saskatchewan just north of the Clover Bar bridge. A large thickness of quicksand (as much as 75 feet in places) has been found in bore holes along this line and the great quantity of water found in wells seems to point to a definite water course along this direction. The Deep Seam Coal Company

recorded very heavy water conditions when sinking their shaft half a mile north of the city limits, and the North American Collieries were forced to sink their shaft by the caisson method due to the quicksand and water encountered.

These washouts may be encountered suddenly in mining or their presence may be intimated in some localities by a whitish incrustation appearing on the coal. Coal having this incrustation has been termed 'spotty coal'. The spots are white to brown in color and consist of carbonates deposited from the water which may have soaked through the coal from the washouts at periods when they were part of a definite drainage system.

A more easily discernable, previous river channel is to be seen on the area of the Clover Bar Coal Company and running south into the property of the Humberstone Coal Company. This valley today is nearly 75 feet deep. The Clover Bar seam is present under the area but in many places in the Clover Bar mine the roof was found to be stream gravel. Washouts on a smaller scale have been reported in the mines at White Mud creek where the coal would run abruptly into a soft sandstone and 10 feet further, back into the coal. As the writer was not able to examine this

peculiarity it is impossible to postulate in regard to this formation.

Minor Structures

(a) Folds.

A definite anticline with its axis lying in a slightly north east, south west direction has been found to exist in Sec. 30, Tp. 53, Rg. 23, W. of 4th. The dip of the coal in the Kent mine indicates this structure. Drilling for gas was carried on in this section many years ago. The quantity of gas encountered was not sufficient to warrant it being piped to Edmonton for fuel.

A very small fold was noticed in the coal seam exposed at Groat Ravine but this structure is purely local.

(b) Rolls.

In some of the mines a peculiar structure known as a roll has been encountered. They are circular in plan and arched upward toward the centre. In places they are 200 feet in diameter and as many as six have been encountered in one quarter section. They seem to be characteristic of the Clover Bar seam and have been found in the Black Diamond, Fraser-MacKay, and Marcus mines. In places the coal has been arched up as much as six feet and is very much sheared,

indicating upthrusting. This latter observation indicates that they are due to post depositional movements. A clue to their cause may be suggested by the fact that the Clover Bar seam is underlain by a layer of pure bentonite. This material swells greatly upon becoming wet, necessitating frequent 'brushing' of tracks in wet mines of the area around Clover Bar town. It is possible that these rolls were once areas in which the underlying bentonite has become wet due to slow seepage, and upon expansion has thrust up the coal.

No faults have been encountered in the area.

(c) Cleavage.

Two distinct cleavages, nearly at right angles, exist in the Clover Bar seam. The major cleavage is in a direction of N. 44° E. at Cardiff, and N. 48° E. at Clover Bar. This angle seems to become less toward the western side of the area, being N. 46° E. in the Chinook mine. Most mines in the area today are laid out such that the entries are driven on the major cleavage and rooms turned off at right angles to the entries. This makes a larger lump type of coal.

CHAPTER V

INFORMATION ON THE GEOLOGICAL MAP

In the construction of the geological map a greater number of the working mines were visited. Outcrops were traced along the North Saskatchewan river and in the various creek valleys of the area.

For the boring records and mine plans used in the construction of both the map and the profile section the writer is indebted to Dr. J. A. Allan of the Department of Geology, University of Alberta; Mr. J. Richards, District Inspector of Mines: Mr. N. Fraser, mine operator, Mr. L. E. Drummond, Mr. L. C. Stevens and Mr. David Jones, mine surveyors of Edmonton; and Mr. J. Hamilton, mine operator, now residing at Lovett, Alberta. Dr. Allan supplied the records of drillings made by Mr. H. A. McKen of Edmonton, and information in regard to the drillings made by the City of Edmonton at Laurier Park.

The locations of the bore holes, mine shafts, and outcrops are indicated on Maps I and II by numbers corresponding to those used in this chapter. The numbering begins at the eastern edge of the large map and moves up and down from the east to the west. Numbers from 38 to 53 inclusive, in the vicinity of St. Albert, and from 123 to 127 inclusive, south of Cardiff, are

shown on Map 2 (Plate 11). Numbers 120, 121, and 122 are in the south eastern corner of the large map and are from drilling records obtained by Dr. D. B. Dowling (57 a). Elevations quoted are from mean sea level. The source of the information for the bore holes is recorded in each case. Bore holes from 39 to 54 inclusive are plotted on Plate No.4, page 100.

The descriptions of each location on the maps are as follows:

1. Marcus Mine Shaft: Location: L. S. 15, Sec. 8, Tp.53, Rge.23, W. of 4th. Elevation at the top of the shaft - 2160.' The Clover Bar seam is mined with a thickness of 4½ feet at the shaft, thickening to over 5 feet at the north, but thinning rapidly to 30 inches to the south-west and south. The Weaver seam is exposed as a very thin member in the shaft.

2. Ottewell Mine: The shaft is 82 feet deep to the Clover Bar seam. This shaft passes through a small seam, (likely No.5). Elevation at top of shaft - 2051'. Elevation of coal - 2069'. Coal is dipping to the south-west by south at 25 feet to the mile. The air shaft on the Ottewell property is 80 feet deep, and its

2. Ottwell Mine (continued):

position is $\frac{1}{4}$ miles west of the main shaft. This seam thins to the north and east from 6 feet to 4 feet or less. Location: S. W. $\frac{1}{4}$ Sec. 17, Tp.53, Rge. 23, W. of 4th.

3. Fraser McKay:

The shaft is 102 feet deep to the Clover Bar seam. Elevation at top of the shaft is 2163'. A small seam less than 1 foot in thickness, (undoubtedly the Weaver seam), is encountered at a depth of 20 feet in the shaft. Location: L. S. 13 and 14 Sec. 8, Tp. 53, Rge. 33, W. of 4th.

4. Keith & Fulton: (No. 69)

A drift mine coal outcropping on the river bank about 25 feet above river level. This is a continuation of the Clover Bar seam and is $6\frac{1}{2}$ feet in thickness. Location: L. S. Sec. 7, Tp. 53, Rge. 23, W. of 4th.

5. William Daly (No. 8):

This mine was worked in the Clover Bar seam by drifts from the outcrops. The thickness of the coal was 6 feet 3 inches, and was

5. William Daly (No. 8) (continued):

approximately 22 feet above the river level. Location: L. S. 10, Sec. 7, Tp. 53, Rge. 23, W. of 4th.

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6. Black Diamond (No. 99):

Surface elevation is 2150', and depth to the Clover Bar seam is 130 feet. The thickness of the coal is 6 feet thinning to the south-west. There are numerous rolls in this area, contributing to the difficulty of mining. The dip is 23 feet to the mile, south-west. Although 6 feet in thickness at the shaft the coal thins slightly to the south as described in 7. The Weaver and Lower seams are both known to exist but are less than 2 feet thick. Location: S.E. ¼ L. S. 10-7, Tp. 53, Rge. 23, W. of 4th.

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7. Old Shaft of Great West Coal Company:

To the Clover Bar seam 167 feet. The coal thins rapidly to the south-west to less than 1 foot in thickness.

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8. Fulton Prospect:

The Clover Bar seam was reached by a slope, the seam being at river level. The thick-

11. A drift mine was opened here in the west bank of Fulton creek L. S. 15 Sec. 36, Tp 24, Rge 53, W of 4th, by Weaver and Clark in 1932. The coal was 6 feet to 6 feet 4 inches in thickness but was in very small lumps, never larger than 4-inch cubes. This characteristic prevailed in other places where the seam was found. Although the analyses are not available, it is known that the coal had a very high calorific value. Considerable water was encountered in mining.

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12. Bore Hole: This hole was put down by Weaver and Clark. Elevation at top of hole is 2180 (approximately). The Weaver seam was struck at 125 feet from the surface and the Clover Bar seam with a thickness of 2 feet 2 inches was found at a depth of 250 feet from the surface, and a very thin third seam (Lower seam?) was reported at 287 feet from the surface. **Information by Mr. Clark.**

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13. & 15. Bore Holes: These holes were drilled for Mr. Fridel of the Red Hot **mine** with a view to determining the thickness of the Clover Bar seam. The coal in 13 **is** 2 feet 10 inches at a depth of approximately 150 feet and in 15 **is** 3¼ feet at a depth of approximately 140 feet.

Location: N.W. cr. Sec. 35, Tp 53, Rge 24, W of 4th.

14. Bore Hole: Mr. Starky drilled to the Clover Bar seam and found it to be 2 feet 1 inch or less.
Location: S. E. cr. N. W. ¼ Sec 35, Tp 53, Rge 24, W of 4th. Information by Mr. Fridel.

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16. Fridel or Red Hot Mine (No. 1357): This company is working the Clover Bar seam at an elevation of 1990 feet above sea level, the top of the slope being at 2048 feet. Although the seam is 5 feet thick with a 1-foot parting (bone) near the river, it thins rapidly to the southeast, the bone band becoming nearly 2 feet in thickness. The general dip is 1½ per. cent. to W in a direction of N 10° W. Precise leveling by Mr. L. E. Drummond and the writer has accurately correlated the seam with the seam mined at the Dawson Mine. The Weaver seam outcrops in the valley about 15 feet above the mine mouth, showing the same broken characteristics as described in 11. A 2-foot seam was encountered while sinking the slope at an approximate elevation of 2020' above sea level.

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17. The Frank Mine: A 45-foot shaft was sunk to the Clover Bar seam. The coal between 4 feet and 4 feet 2 inches through the mine. The mine is now abandoned and full of water.
Location: N. E. end R. L. 31. Edmonton.

18. No. 5 seam with a thickness of 2 feet is exposed in the bank about 35 feet above low water level.

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19. Section measured in the river bank south of the Bush Mine showed three seams of coal; the Lower seam at river level was the top of the Clover Bar seam and had a thickness of approximately 3 feet.

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20. Malloy & Raymond: A small drift was opened at river level on river Lot 38. This mine or working is probably in the small non-persistent seam which lies above the Clover Bar seam (10 feet above) in this vicinity.

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21. Bush Mine Shaft (No. 1032): Elevation at surface is 2100 feet above sea level. Elevation at Clover Bar seam is 1954 feet above sea level. Coal is 4½ feet at the shaft increasing to 5 feet to the north but thins to 3 feet to the south.

---

22. Workings of the old Bush Mine in the Clover Bar seam. The coal is 6 feet thick and dips to the south and west.

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23. Ketchum Coal Company: This mine was worked on the southeastern part of the Humberstone property in the Clover Bar seam. Thickness between 6 feet and 7 feet.

24. **Booth Mine:** Working the Clover Bar seam. Forty feet above river level. The coal is 4½ feet thick with an 8-inch part of clay.

25. **Humberstone Mine Shaft (No.43):** Coal in this mine was from 6 to 7 feet thick. Dull and not banded.

26. **Clover Bar Mine Shaft (No.9):** Shaft 85 feet deep; In parts of the mine, the roof was gravel. A washout was struck all along north boundary of the mine. "Spotty " coal was encountered in the N. W. corner of the area mined.

27. **Bore Hole:** 50 north of south boundary of workings; did not strike Clover Bar seam. The material struck was gravel and sand.

28. **Beverly Mine Shaft:** Elevation at the top of the hoisting shaft is 2130 feet above sea level. Elevation at the bottom of the Clover Bar seam is 1982 feet above sea level. The coal is 5 feet 10 inches thick with a 1-foot coal band left for a roof.

29. **Bore Hole at Creosote Plant:** No coal was struck in this place when the bore hole was sunk, and considerable sand and gravel was encountered. Information by Mr. D. Jones.

30. A shaft was sunk in the valley of Second Rat creek, Sec. 24, Tp.53, Rge. 24, W. of 4th in expectation of finding the Clover Bar seam at 100 feet but the coal was found to have been eroded by the washout.

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31. Dowling (54-b) states that drilling indicated a 4½ foot seam on N. E. cr. of Sec. 26, Tp. 53, Rge. 23, W. of 4th. Depth was not stated.

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32. Bore Hole drilled by Cunningham Brothers:

Location: S.W.¼, Sec.11, Tp.54, Rge, 24, W. of **4th**, in the southeast corner of quarter. Section was as follows:

0 - 2 feet	loam
2 -12 "	gumbo clay
12 -30 "	alternate sandstone and shale.
30 -40 "	shaly clay
40 -41 "	dirty coal
41 -60 "	shale
60 -60 1/6	hard clean coal
60 1/6-66 "	brown clay.

Source of information - Mr. J. Richards.

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33. Bore Hole drilled by Cunningham Brothers;

Location: Same as 32 but in centre of quarter.

0 - 2 feet	loam
2 -12 "	Yellow (glacial) clay.
12- 16 "	hard clay
16- 17 "	dirty coal
17- 45 "	sandy clay
45- 50 "	hard clean coal
50- 63 "	hard shaly coal

Source of information - Mr. J. Richards.

34. Mine Shaft: Strata passed through by the Ruperts Land Coal Company while mining on Sec. 11, Tp.54 Rge. 24, W. of 4th as recorded by Dowling (54-b) from notes taken by Frank Smith were recorded as follows:

0 - 10 feet	alluvial clay
10 -12 "	hard clay shale
12 - 20 "	coal (probably shaly)
20 - 20½ "	clay shale
20½-28 "	hard clay shale
28 - 34 "	coal.

35. Bore Hole of Middleton-Rowland Property: See (12)

Location: S.E.¼, Sec. 27, Tp.53, Rge, 24, W. of 4th

1 - 35 feet	glacial debris
35 - 95 "	clay
95 - 96.5 "	coal
96.5 - 141 "	coal hard pan
141 - 143 "	sandstone (float)
143 - 145.5 "	soft clay
145.5 - 147 "	sandstone
147 - 151 "	shale
151 - 153 "	sandstone
153 - 163 "	shale, grey
163 - 163.5 "	rock, very hard
163.5 - 165 "	soft shale
165 - 165.5 "	rock, very hard
165.5 - 178 "	shale
178 - 179 "	soft rock
179 - 185 "	grey shale
185 - 185.5 "	rock, hard
185.5 - 189.9 "	shale
189.9 - 190.9 "	coal
190.9 - 192.9	shale
192.9 - 195 "	coal
195 - 232 "	layers of shale, and sandstone.
232 - 247 "	hard layers
247 - 250 "	coal
250 - 250.2 "	parting
250.2 - 255 "	coal
255 - 257 "	brown shale.

Source of information - Mr. J. Richards.

36. A water well was drilled on the property of Mr. A. E. Jackson by Mr. H. A. McKen of Edmonton. Location: 3 miles north of city limits, on 127 Street. Coal was encountered at the following depths from the surface:

123-125 feet ...... coaly shale
133-134 " ...... coal
237-239 " ...... coal

The second seam from the top is thought to be the Clover Bar seam. A 4 foot bed of gravel was encountered in drilling between 23 and 27 feet from the surface.

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37. A water well was drilled on the property of Mr. W. Hober by Mr. H. A. McKen of Edmonton. Location: 1 mile north of the city limits, Calder. This well was drilled 123 feet but no coal was encountered. The Clover Bar seam, if present, would lie at least 40 feet below the bottom of this well.

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38. Bore Hole drilled for M. C. H. Dixon by Mr. H. A. McKen of Edmonton. Location: ½ mile north of city limits on 146 Street. Drilling passed through coal at the following depths:

141-144 feet ...... coaly shale
158-161 feet ...... core. 6 inch coal, 18 inches bone, 12 inches brown shale.

38. Bore Hole drilled for Mr. C. H. Dixon (continued)

189-199 feet ...... Core 10 inches coal, 2 inches clay, 27 inches coal, 14 inches bone, 9 inches coal, 7 inches bone, 4 feet 6 inches brown clay.

215-216 " ...... coaly shale with heavy flow of soft water.

Quicksand was encountered between 80 and 85 feet from the surface.

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39. A test hole was put down by Mr. J. Dowdell in S. E. cr., Sec. 35, Tp.53, Rge. 25, W. of 4th. struck the Clover Bar seam with a thickness of from 3 to 4 feet at a depth of 203 feet. A smaller seam of 1 foot thickness was passed through at a depth of 152 feet.

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40. It has been reported that a bore hole one mile north of No. 39 was drilled and reached from 3 to 4 feet of coal at a depth of 199 feet. This seam is in all probability the Clover Bar seam.

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41. A water well was drilled by Mr. H. A. McKen on the N. E. ¼ S. 26, S.E.¼ S.35, Tp.53, Rge. 25, W. of 4th. Coal was encountered at the following depths from the surface:

29-41 feet ..... sand with streaks of clay with small seams of coal in the clay.

41. (continued)

120 - 121 feet	sand with coal mixed in it.
156-- 159 "	sand with small stringers of coal mixed in it.
198 - 203 "	hard coal.

This latter seam is the Clover Bar seam.

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42. A water well was drilled on the property of Mr. A. Cheriot. Location: 1 mile from city limits on St. Albert Trail. The well was drilled by Mr. H. A. McKen of Edmonton. Drilling showed coal at the following depths:

158- 161 feet 8 inches	coal
228 -231 "	coaly shale
231 -236 "	coal. Heavy flow of water at bottom of the vein of coal. (soft water.)

This bottom seam is thought to be the Clover Bar seam.

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43. A water hole was drilled for Mr. A. Pelletier on the St. Albert Trail, 1½ miles from the city limits, by Mr. H. A. McKen. Drilling showed coal at the following depths:

142-145 feet	coal
204-208 "	coal. Heavy flow of water encountered immediately under coal.

The bottom seam is likely the Clover Bar seam.

43. (continued)

Quicksand was encountered between 46 and 88 feet from the surface.

---

44. Bore Hole on N. E. cr., Sec. 27, Tp. 53, Rge. 25, W. of 4th, put down by Mr. H. A. McKen of Edmonton. Drilling showed coal to exist at 220 feet from the surface. This seam is the Clover Bar seam.

---

45. Bore Hole on the property of Mr. W. Maloney, St. Albert, drilled by Mr. H. A. McKen of Edmonton. Location: 1 mile north of the town of St. Albert. The following seams were passed through in drilling:

142-147 feet	......	lenses of coal and carbonaceous shale.
147-148 "	......	coal.
148-150 "	......	shale and coal, showing a strong vein of water.
152-157 "	......	dirty coal (layers of r rock coal and shale)
192-193 "	......	coal.
295-315 "	......	grey shale with small layers of coal (about 1 inch)
319-324 "	......	dirty coal.

---

46. A water well was drilled for the St. Albert Hotel, St. Albert, by Mr. H. A. McKen at the edge of the Sturgeon river. Drilling showed coal at

the following depths below the surface:

196 - 200 feet ...... coaly shale
200 - 204 feet ...... coal

Running quicksand was encountered between 47 and 152 feet from the surface.

47. **Bore Hole:**

Dowling records the finding of coal in a bore hole on Sec. 13 Tp 53 R 25 at the westerly end of the city limits. A bore hole reached coal at 240 feet. The coal seam is 5 feet in thickness.

48. **Bore Hole:**

N. E. Cr. Sec. 22, Tp. 53, Rge. 25, W. of 4th.

0 - 32 feet ...... clay
32 - 56 " ...... sand
56 - 65 " ...... clay
65 - 85 " ...... sand
85 - 103 " ...... clay
103 - 118 " ...... sand
118 - 218 " ...... very hard clay
218 - 225 " ...... coal and bone
225 - - 238 " ...... clay and shale
238 - 243 " ...... coal (Clover Bar seam)

Drilled by Bush Diamond Drill Company.

This information was obtained from Mr. J. Hamilton, now residing at Lovett, Alberta.

49. **Bore Hole:** Dowling also records the finding of coal near the railway bridge on Lot 53, 20 feet above the track, depth 268 feet, thickness of coal 7 ft.

50. Bore Hole: Dowling (54-b) further recorded the finding of coal in centre of Lot 54, lower than the track at 229 feet and 7-foot coal.

51. Bore Holes: A further report by Dowling (54 -c) shows the finding of coal close to the south edge of Lot 54. Depth 261 feet to the coal.

52 Shaft No. 2 of St. Albert Colliery:

Location: 1½ miles south of St. Albert, Sec. 28, Tp. 53, Rge. 25, W. of 4th.

0	-	34 feet	yellow clay
34	-	84 "	sand
84	-	91 "	sand clay
91	-	101 "	clay
101	--	107 "	clay and gravel
107	-	129 "	very tough clay
129	-	131 "	clay and sand
131	-	183 "	fine sand
183	-	187 "	coarse gravel
187	-	191 " 6 in.	sand and gravel
191 ft.6 in.	-	201 " 6 in.	coarse sand
201 ft.6 in.	-	208 "	shale
208 ft.	-	210 "	coal
210	-	217 " 6 in.	sandy shale
217 ft.6 in.	-	225 " 5 in.	brown shale
225 ft. 5 in.	-	240 "	shale
240	-	255 "	arenaceous shale
255	-	295 "	shale
295	-	296 "" 4 in.	coal
296 ft. 4 in.	-	297 " 1 in.	bone
297 ft. 1 in.	-	298 " 1 in.	coal
298 ft. 1 in.	-	299 "	bone
299 "	-	301 "	coal
301 "	-	302 " 1 in.	bone
302 " 1 in.	-	302 " 9 in.	coal
302 " 9 in.	-	314 " 9 in.	shale
314 " 9 in.	-	322 " 3 in.	coal
322 " 3 in.	--------		shale.

This information was obtained from the Trans. of C. I. M. and M. (1916) , p. 270

53. Bore Hole:

On property of A. Brunell, River Lot No. 3, St. Albert settlement. Driller, Mr. H. A. McKen, Edmonton. Drilling showed coal at the following depths from the surface:

61-65 feet ...... coal shale with coal lenses.
65-72 " ...... dirty coal.
74-84 " ...... coal

The lower seam is thought to be the Clover Bar seam.

---

54. Water well drilled for Mr. J. Goethals by Mr. H. A. McKen of Edmonton. Location: 4 miles west of St. Albert trail on Alberta Avenue. 1 foot of coal was encountered at a depth of 217 feet below the surface.

---

55. Water well drilled on the property of Mr. S. L. Dagard, on River Lot 16, St. Albert Settlement by Mr. H. A. McKen of Edmonton. Coal was encountered at the following depths below the surface:

186-191 feet ...... coal shale
191-195 " ...... coal
242-247 " ...... coal
252-296 " ...... grey shale with small layers of coal.
296-302 " ...... coal shale.
302-306 " ...... coal.

56. Deep Seam Coal Syndicate Slope:

Location: L. S. 2, Sec. 28, Tp. 53, Rge. 24, W. of 4th. A slope was driven at an angle of 30 degrees and encountered two seams, one a 2-foot seam at a vertical depth of 197 feet and a second seam 7 feet 8 inches at a depth of 247 feet. This latter seam is more likely to be the Lower seam than the Clover Bar seam, which is represented by the 2-foot member. Heavy water conditions were encountered in mining. Work on this slope was suspended in the early spring of 1934.

---

57. Water well drilled for the Northern Alberta Dairy Pool, 102 Street and 105 Avenue, Edmonton, by Mr. H. A. McKen. Drilling indicated coal at the following depths from the surface:

205 - 207 feet ...... coal
220 - 223 " ...... coaly shale
241 - 242 " ...... coal
259 - 261 " ...... coal(Clover Bar seam?)
273 - 274 " ...... coal

Running quicksand was encountered between 73 and 82 feet from the surface. The thinness of the Clover Bar seam is to be expected as it is believed that this well is close to the previous northern shore line of the basin. This condition is also seen in the Old Penn and Parkdale mines.

58. Parkdale Mine: River Lot 22, Edmonton. The Clover Bar seam was reached at a depth of 197 feet by a vertical shaft. Although a thickness of 4½ feet at the shaft this coal thinned to less than 3 feet on the northern boundary. Thirty feet below this seam the Lower seam was encountered with a thickness of 3½ feet and the Weaver seam was encountered approximately half way down the shaft, showing a thickness of 2 feet.

59. Bore Hole: 500 feet north of Parkdale Mine. This bore hole reached the Clover Bar seam at a depth of 207 feet but it had thinned to less than 1½ feet.

60. Penn Mine (No. 632): Elevation at top of shaft is 2170' approximately. Shaft was 247 feet to the Clover Bar seam and the coal was lustrous and 6 feet in thickness but dropped to 4 feet at the northern end to the northwest of the area. The dip was to the southwest. This mine has been abandoned.

61. Chinook Mine: This mine worked the Clover Bar seam with a thickness of 5 feet 8 inches to 6 feet. The Lower seam is known to exist with a thickness of nearly 4 feet but was not mined.

62. Ritchie (United Collieries): R. L. 20, Edmonton. This mine mined the Clover Bar seam with a thickness of 5 feet 11 inches on an average and it thinned to the north to a thickness of 5 feet 4 inches. The Lower seam, 29 feet below the Clover Bar seam, was reported to have had a thickness of over 6 feet but was not worked due to its proximity to the Clover Bar seam.

---

63. Dawson Mine Shaft (Mine No. 155): River Lot 25. Elevation at top of shaft 2060 feet approximately. Shaft 104 feet deep to 5 feet of coal. The bone beds normally less than 7 inches increase markedly to the south. A 3-foot seam was found in the shaft at depth of approximately 30 feet. (Seam No. 6). Seam No. 5 is seen at river level in the bank with a thickness of 5 feet. Borings have shown the presence of the Lower seam with a 2½-foot thickness, 37 feet below the Clover Bar seam.

---

64. Standard Mine: River Lot 26, Edmonton. Operated by McPeak Coal Company. The air shaft was 128 feet deep reaching the Clover Bar seam with a thickness of 5 feet of coal with no parting. Some work had been done in the Lower seam (4 feet 5 inches) but due to the cavings from

64. (Continued).

above and the presence of gas this seam was abandoned. The coal thinned slightly to the north and northwest, reaching at times a thickness of less than 4 feet. This mine has been abandoned for several years.

65. Premier Mine (No. 869): Operated by J. Dowdell on R. L. 24, Edmonton. The Clover Bar seam is mined; the thickness of the seam is uniformly from 5 feet to 5 feet 2 inches. The elevation at the top of the shaft is 2092 feet. Workings of this mine have encountered those of the Standard on several occasions. The coal has a bright banded appearance, resembling the Dawson coal.

66. Bore hole on the top of the Dawson Hill on 62 Street Log as follows:

0 - 38 feet....glacial boulder clay
38 - 44 " ....blue mud
44 - 46 " ....clay with coal lenses
46 - 48 " ....dirty coal (Weaver seam)
48 - 53 " ....soft brown clay
53 - 126 " ....shale and clay
126 - 128 " ....coal
128 - 156 " ....shale and mud rock
156 - 157 " ....coaly shale
157 - 161 " ....shale with lenses of coal.

Elevation at top of hole--2100 feet (approximately)

Well drilled by Mr. H. A. McKen, Edmonton.

67. Shaft of Twin City Mine (No. 177): Elevation at top of shaft is 2075 feet above sea level. Elevation at top of Clover Bar seam 1939 feet above sea level. Coal is 5 feet thick with partings showing to the south. Weaver seam shows in the shaft as 1 foot seam at 2007'.

---

68. Bore Hole at Mill Creek. (54d) Elevation at top of hole 2017. Clover Bar seam 7 feet 5 inches thick at 1845'. A 2 foot 6 inch seam was encountered at 1975'. Likely No. 5. The Lower seam is 30 feet below the Clover Bar. Thickness is not given.

---

69. First Humberstone Mine. Worked in the bank 400 feet east of the MacDonald Hotel. This mine was in the Weaver seam. Thickness about 4 feet 5 inches.

---

70. Bore Hole at City Power Plant Elevation at top of hole 2035' (approximately)

At 1920 -- 3 foot coal - Clover Bar Seam.
1898 -- 1 foot coal - Lower seam
1835 -- 3 foot coal - No. 2 seam.

---

71. Section measured on bank below Parliament Buildings: Weaver seam 2½ feet thick, exposed 33 feet above river. No. 6 seam of undetermined thickness at water level.

72. and 73. Sections examined in the south bank of the river, showing No. 6 seam at water's edge and No. 7 (Weaver seam about 35 feet above and 3 feet thick)

74. The Strathcona Mine. Elevation at top of shaft 2175 feet. The Big Island seam 4½ feet thick is exposed at the top of the shaft. The seam mined (likely the Weaver) is 5 feet thick at 2085.

75. Bore hole at 250 feet east of High Level bridge near the top of the bank (2175). Two seams were struck according to Dowling:
2 foot seam at 2011 (Weaver or No. 5)
2 foot seam at 1990 (Clover Bar?(?)

76. A shaft was put down to the Clover Bar Seam on the Municipal golf links. The information on the depth was not obtained but the coal was not of mineable thickness.

77. The Big Island seam is exposed in the bank S E. of Mayfair golf links. The seam is 4 feet thick approximately.

78. The Weaver seam is exposed in the bank 27 feet above the river level. The roof is gravel where

78. (cont.)
examined. The coal is in good lumps and 4 feet thick.

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79. The Weaver seam disappears under the river at Groat ravine.

---

80. Mr. Taylor has noted the presence of the Weaver seam just at river level. No thickness was determined.

---

81 and 82. Big Island seam is exposed in the banks with a thickness of 3½ feet about 55 feet above the low water level.

---

83. Well drilled at University Farm. Elevation at top of hole 2177 feet (approximately(.

1 foot coal at 145 feet (2032)
2 foot coal at 185 feet (1992)

The latter seam is possibly the Weaver seam.
Information obtained from Dr.J.A.Allan.

---

84. Bore Hole on the Gibbons property for the city of Edmonton. Elevation at top of hole 2170 feet.

1 foot 8 inch coal at 160 feet (2110)
3 foot 6 inch coal at 223 feet (1947)
4 foot 6 inch good coal at 301 feet (1859)
(Clover Bar seam)

84. (cont.)
A shaft was sunk near this hole but it ran into a part of the previous river course and the seams were not proven.

85. A second hole 500 feet N. of 84. It proves the same conditions as in 84.

86. Third hole on the Gibbons property, 600 feet north of 85. The Clover Bar seam was reported to be from 4 feet 6 inches to 6 feet 6 inches.

87. Bore hole on the same property went down 145 feet to the first seam encountered in 84. The thickness was less than 2 feet.

88 and 89. The Big Island seam is exposed in the banks of the river at these points about 20 feet above the river level. The coal is 3½ feet thick.

90. Flood plain developed for several hundred feet on either side of the mouth of White Mud creek.

91 to 97. Coal and carbonaceous shale is seen to outcrop at intervals along the White Mud creek. This is the Big Island seam.

98. Berube mine No.29: This mine is working as a drift in the north bank of the White Mud creek. Location, Section 25, Tp.$\overset{51}{52}$, R. $\overset{25}{24}$. The Big Island seam is worked with a thickness of 4 feet 6 inches. The coal becomes bony to the north. Elevation of coal is 2118 feet above sea level.

---

99. Fridel mine # 1022: This mine is a drift into the Big Island seam. About 400 feet west of Berube mine. The coal is 3 feet 5 inches at the mouth of the drift.

---

100. Unnamed drift mine: 300 feet S. W. of Fridel mine. The coal is 3 feet thick.

---

101. Drift mine # 1233 into Big Island seam. 200 feet west of the mine at Location 100 the coal is 3 feet thick.

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102. F. B. Smith's mine (old # 29): This mine is across the creek from the Fridel mine and in the same seam. The section of the coal is

Coal - 2 feet 4 inches;
Clay - 2 inches;
Coal - 2 feet 8 inches;

There is an area of washout in the western part of this mine.

103. White Star, Junior (# 877); and Edmonton Cartage Co. drifts: South of the creek from the Berube mine and working in the same seam. The coal becomes very soft to the east and south east.

---

104. Unnamed drift in the Big Island seam. At Big Island the coal is 4 feet thick.

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105. Big Island Coal Co. drift mine: in the Big Island seam at Big Island. The seam is about 25 feet above the low water level. The thickness of the seam was not ascertained.

106,107,and 108. Small drifts in the Big Island seam just opposite Big Island on the east bank of the river. The coal is between 4 and 5 feet thick and about 25 feet above the low water level.

---

109 to 113. The Big Island seam is exposed at these points about 30 feet above the low water level, according to Mr. Taylor's observations.

---

114. Another well was reported to have been sunk near the first well drilled in 1906 at the City Power Plant. Log is similar to that of first.

---

115. Cameron Mine, River Lot No.16, Edmonton.
Dowling states that the Clover Bar seam was found at 65 foot depth, A 3 foot seam was found (likely No.5) at 33 feet below water level.

116. Boring for gas in Edmonton on north side Jasper Avenue, eastern end of town. As this is a deep hole great care was not taken in getting the exact depth at which coal seams were passed. The following coal seams were noted:-

Natural surface about 2165 feet above sea.
A small seam of coal at 2075 feet above sea.
Bottom of an 8 ft. seam at 1950 feet above sea.
Top of a 9 ft. seam at 1942 feet above sea.
Coal said to be 6 ft. seam at 725 feet above sea.
This latter seam at a depth of 1440 feet must be in the Belly River formation.

117. Baldwin mine, River Lot No. 23 A, Edmonton.
Dowling (54d) states in his report the following information:

A Seam 2 feet 8 inches 57 feet above river.
Seam 1 foot 6 inches at level of water.
Seam 3 feet 0 inches 15 feet below water.

119. A well was put down at the Gainer Packing plant striking 5 feet of coal. The depth of well has not been ascertained.

Quotation from Dowling (8) p 34.

120."Bore on section 5, township 53, range 23.

Depths 35 feet to 7 feet coal.

55 feet to 8 feet coal.

Without leveling to find this place I have assumed that these two seams are near the surface. The ground near this is at 2194 feet, so that the coal seams occur at the following elevations, approximately:--

7 ft. seams is at 2169 feet above sea.

8 ft. seam is at 2149 feet above sea."

---

121. Boring on northeast corner section 6, township 53, range 23.

Ground about 2180 feet above sea.

Coal 6 feet, 2120 feet above sea.

Coal 9 feet 6 inches, 2011 feet above sea.

---

122. Bore on north part section 5, township 53, range 23, ground slightly higher than above. i.e., (121)

Ground 2194 feet above sea.

Coal 6 feet, 2104 feet above sea.

Coal 9 feet, 6 inches, 2020 feet above sea.

The following bore hole logs were recorded by Mr. Norman Fraser and their locations are marked on Map # 2, to be found in the pocket.

123.	0 ft.	to 3 ft.	- black soil.
	3 ft.	to 47 ft.	- clay with gravel.
	47 ft.	to 71 ft.	- blue clay
	71 ft.	to 74 ft.11 in.	- blue shale
	74 ft. 11 in.	to 76 ft. 1 in.	- harder shale
	76 ft. 1 in.	to 76 ft. 6 in.	- sandstone.
	76 ft. 6 in.	to 82 ft. 3 in.	- clay
	82 ft. 3 in.	to 82 ft.10 in.	- coal
	82 ft. 10 in.	to 90 ft. 5 in.	- clay
	90 ft. 5 in.	to 95 ft.	- coal
	95 ft.	to 108 ft. 7 in.	- brown shale.

Location of this bore hole - N.W.¼, Sec. 13, Tp.55, R. 25, W. of 4th.

These measurements taken from top of peg driven into ground beside borehole. Peg 7 in. in height. This hole evidently in fault. Elevation at top of hole - 2295 ft. (approximately).

124. Location - N. E. part of the N.W.¼, Sec.13, Tp. 55, R. 25, W. of 4th.

1 ft.	to 6 ft.	- black soil
6 ft.	to 34 ft.2 in.	-blue & yellow clay.
34 ft. 2 in.	to 35 ft.	-soft coal
35 ft.	to 39 ft.6 in.	-brown shale
39 ft. 6 in.	to 42 ft.8 in.	-coal
42 ft. 8 in.	to 47 ft.2 in.	-coal and clay
47ft. 2 in.	to 49 ft.7 in.	-coal
		clay parting
49 ft. 7 in.	to 51 ft.2 in.	-coal
		clay parting
51 ft. 2 in.	to 55 ft.6 in.	-coal
55 ft. 6 in.	to 61 ft.3 in.	-shale.
61 ft. 3 in.	to 61 ft. 9 in.	coal
61 ft. 9 in.	to 65 ft. 3 in.	shale.

Measurements taken same as previous boring. Elevation at top of hole 2285.

125. Location: N.E. part of the N.E.¼, Sec. 14,

Tp. 55, R. 25, W. of 4th.

Elevation of top of hole -- 2295

0	to 1 ft.	black soil
1 ft.	to 43 ft.6 in.	yellow and blue clay.
43 ft.6 in.	to 55 ft.9 in.	coal.
55 ft.9 in.	to 58 ft.5 in.	clay.

Measurements taken from peg driven into ground beside bore hole. Peg 6 inches above ground.

---

126. Location: S.E. part of the N.E.¼, Sec. 14,

Tp. 55, R. 25, W. of 4th.

Elevation of top of hole -- 2295.

0	to 2 ft.	black soil.
2 ft.	to 22 ft.	clay yellow.
22 ft.	to 30 ft.	sand with water.
30 ft.	to 48 ft.9 in.	clay.
48 ft.9 in.	to 53 ft.10 in.	coal
53 ft.10 in.	to 59 ft.10 in.	clay
59 ft.10 in.	to 61 ft. 4 in.	coal
61 ft. 4 in.	to 65 ft. 3 in.	clay.

Measurements taken same as 125.

127.

Location: S.W. part of N.W.¼, Sec.13, Tp.55, R. 25, W. of 4th.

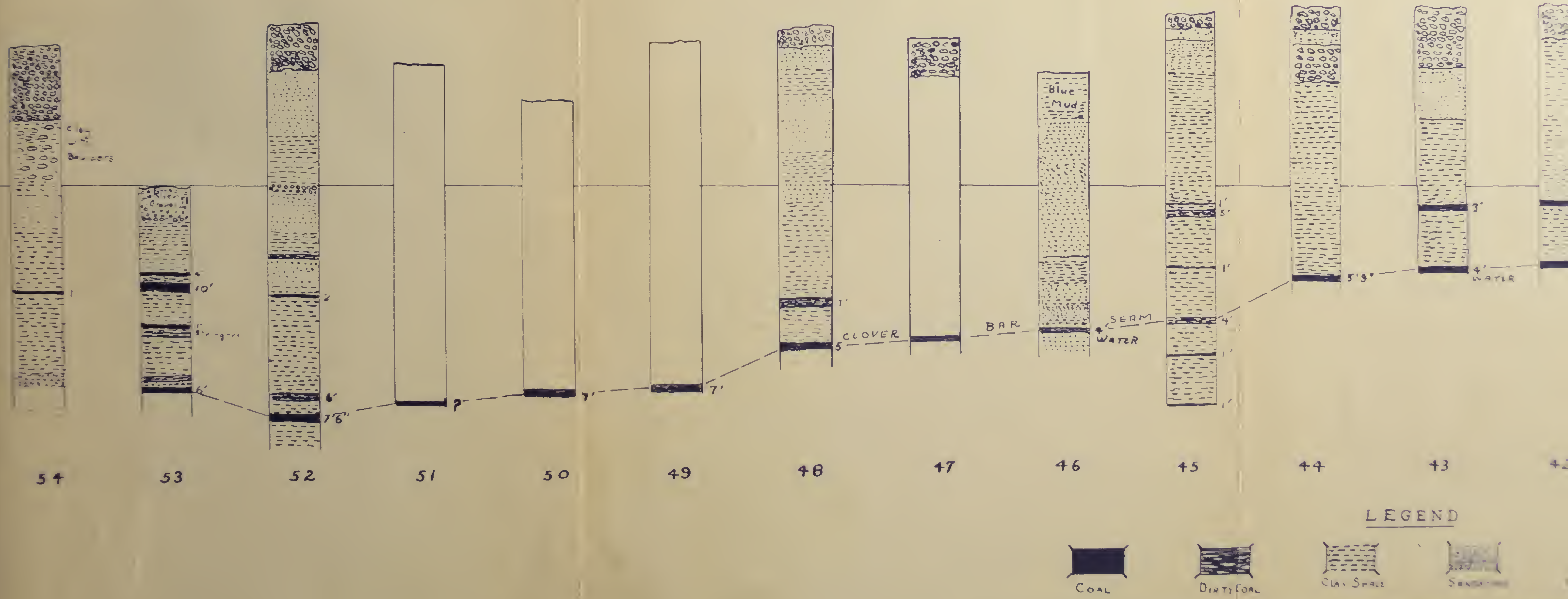
0	to 1 ft.	black soil
1 ft.	to 42 ft.	clay
42 ft.	to 42 ft.10 in.	coal
42 ft.10 in.	to 44 ft. 3 in.	black shale.
44 ft. 3 in.	to 47 ft. 1 in.	coal
47 ft. 1 in.	to 49 ft. 1 in.	brown shale
49 ft. 1 in.	to 51 ft.8 in.	Coal with 6 in. clay band.
51 ft. 8 in.	to 52 ft. 6 in.	coal
	Parting	
52 ft. 6 in	to 55 ft. 11 in.	coal

127. (continued)

55 ft. 11 in.	to	62 ft.	clay
62 ft.	to	63 ft. 5 in.	coal
63 ft. 5 in.	to	76 ft. 5 in.	shale
76 ft. 5 in.	to	79 ft. 3 in.	brown shale
79 ft. 3 in.	to	82 ft.	hard shale
82 ft.	to	85 ft.11 in.	coal
85 ft. 11 in.	to	88 ft. 5 in.	brown shale.

STRATIGRAPHICAL SECTIONS of BORE HOLES

SHOWING THE POSITION OF THE CLOVER BAR S

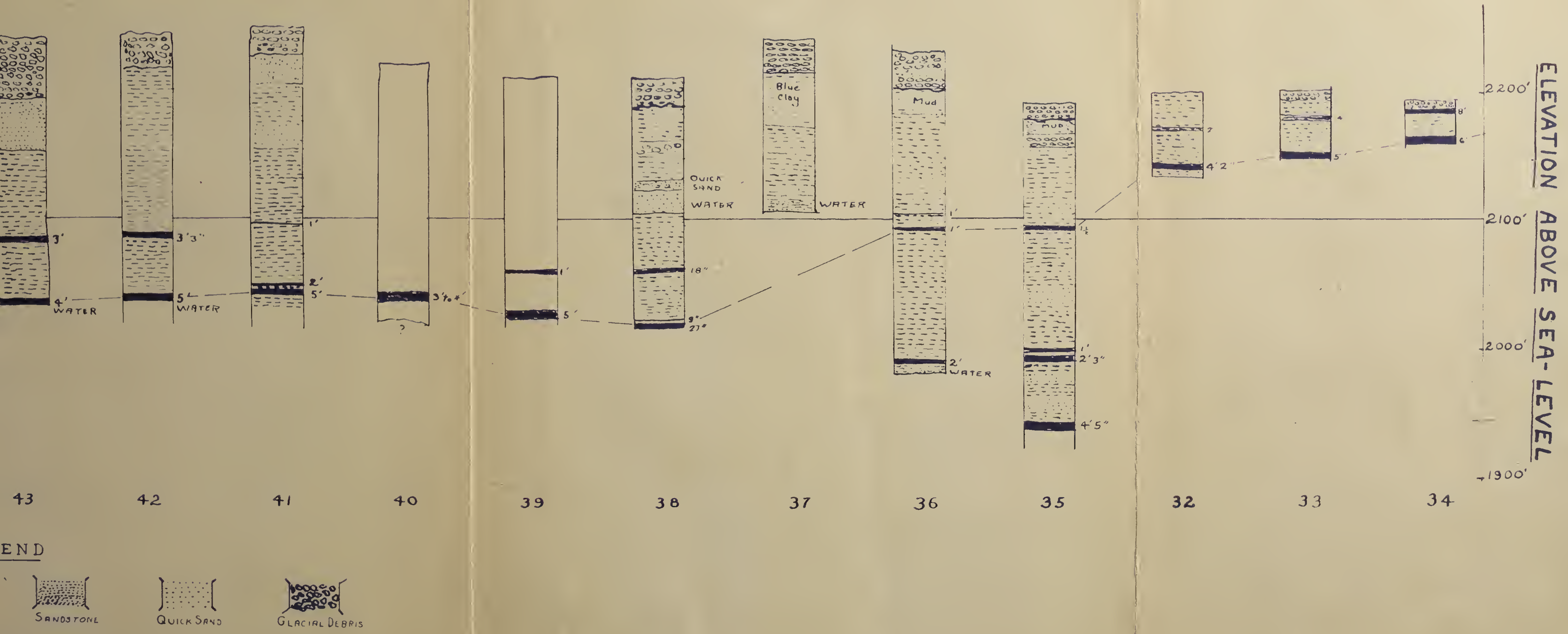


LOCATION and DESCRIPTION of EACH LOG WILL BE FOUND UNDER

PLATE No 4

HOLES IN EDMONTON COAL AREA

VER BAR SEAM ALONG THE LINE E-F(Map II)



BE FOUND UNDER ITS NUMBER in CHAPTER III

DRAWN BY
H.H. BEACH

Chapter VI.

MINING METHODS

The mining methods employed in the Edmonton area are typical of those used throughout the flat seams of the province and the western United States. The coal is reached in one of three ways; drifts, where mining is carried on at the outcrop in some valley or natural depression; slopes, when the coal is not more than 100 feet vertically from the surface; and shafts when the coal is more than 100 feet down.

No mine is working at a depth greater than 300 feet at the present time in the Edmonton area, although the North American Collieries sunk a circular concrete shaft by the caisson method to the Clover Bar seam lying 320 feet from the surface.

The cost of sinking shafts depends on the position of the mine in the area. To the north and north west of Edmonton an operator can safely budget for double the normal sinking costs due to the presence of nearly sixty feet of quicksand which has to be driven through by forepoling or caisson methods. This same difficulty has recently been encountered in the south-

eastern part of the area. The Kent Coal Company, located at Sec. 30, R. 23, Tp. 52, W. of 4th, found the running quicksand made shaft sinking nearly impossible.

From a study of the logs of water wells in the district it seems likely that this type of difficulty will be encountered generally in a strip of about one mile in width running from the southern end of the town of St. Albert to the Clover Bar bridge. The water table is low in this area and even after mines have started production a considerable amount of water will have to be handled and as shaft depths to commercial seams will of necessity be at least one hundred and eighty feet deep;this item will add materially to the cost of production, and practically prohibits operation in this area with the present selling price of coal.

Layout of Mines.

The room and pillar method of mining is almost universally employed. One, two and three entry systems have been used. Although the primary development costs are slightly higher, the three entry system lends to greater ease of ventilation and more comfortable working conditions for winter work. In this method the central haulage way is the air return, splits being taken off the two outside entries which are intakes to the workings.

The entries are driven parallel to the major cleavage and the rooms are turned off at right angles to these entries. This arrangement makes a greater size of lump coal with minimum powder costs.

Long Wall Mining.

A variation of the room and pillar method known as 'long wall' has been attempted in this area at different times with very disappointing results. The success of advancing or retreating long wall mining depends upon two factors:

(1) a continuous market.

(2) a strong roof above the coal that will 'take the squeeze' slowly and not shear off at the face if left for a day or two.

From the standpoint of these two factors the Edmonton coal area has much to be desired. The roof is heavy in the greater part of the area underlain by the Clover Bar seam, often requiring considerable timbering to hold it up even in room work. The market is intermittent, the winter being the best season. Even then orders may not be sufficiently plentiful to guarantee daily work and true 'long wall' is out of the question where the face is let stand for more than two or three days.

Two methods of emulating the 'long wall' system

have been suggested and recently tried out. As they have many points of merit and have proven successful where tried, they will now be discussed.

"Room Length" Long Wall or "Slabbing".

This method of mining is applicable to the entry systems used at present. Room necks are turned off from the entries with from 30 to 40 foot centres but continued from the entry until an area of coal within a few feet of half the distance to the next entry is blocked off. This is shown in Figure A, Plate No. 5 Track is then laid and a coal cutting machine runs a cut for nearly the full length of the room, a barrier being left to protect the entry. The machine is then taken to the next room and run along the wall closest to the room last cut. This coal is then shot and loaded. Track is then moved closer to the face and occasional timbers placed along the side of the track remote from the working face. This procedure is repeated, alternating between the two rooms, until one cut remains separating them. It has been found in practice that even this remaining cut can be taken if it is quickly loaded and track drawn shortly after cutting.

This method has been tried in the Beverly and Black Diamond mines. It has been found by experience that over this comparatively small area the roof

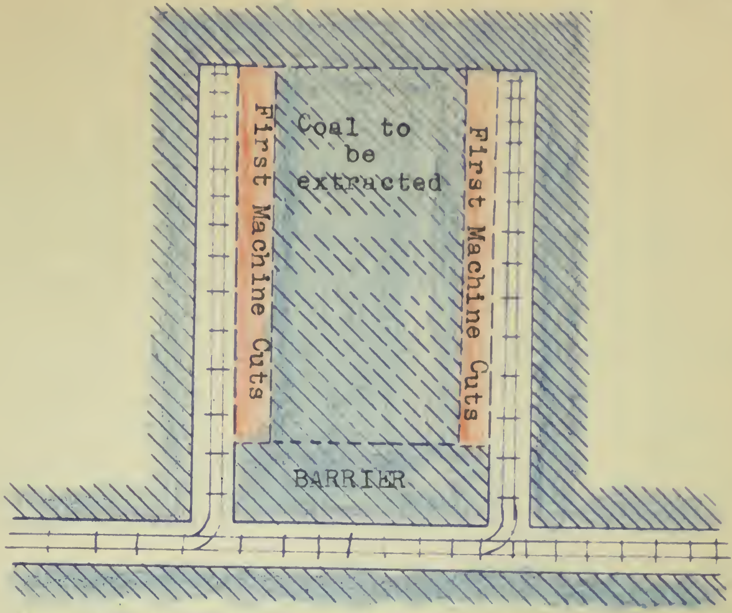


Fig. 1 (a) "Room length" Modification of Long Wall Method of Mining, showing the first machine cuts to be taken.

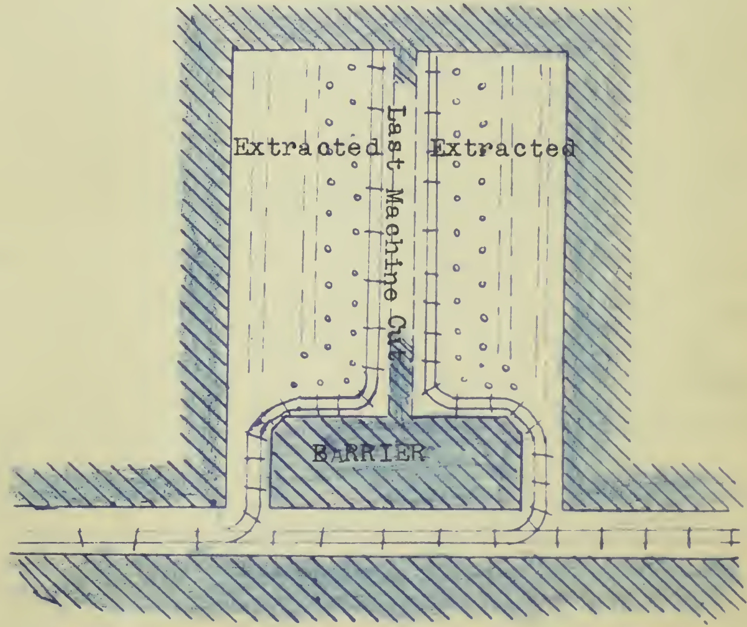
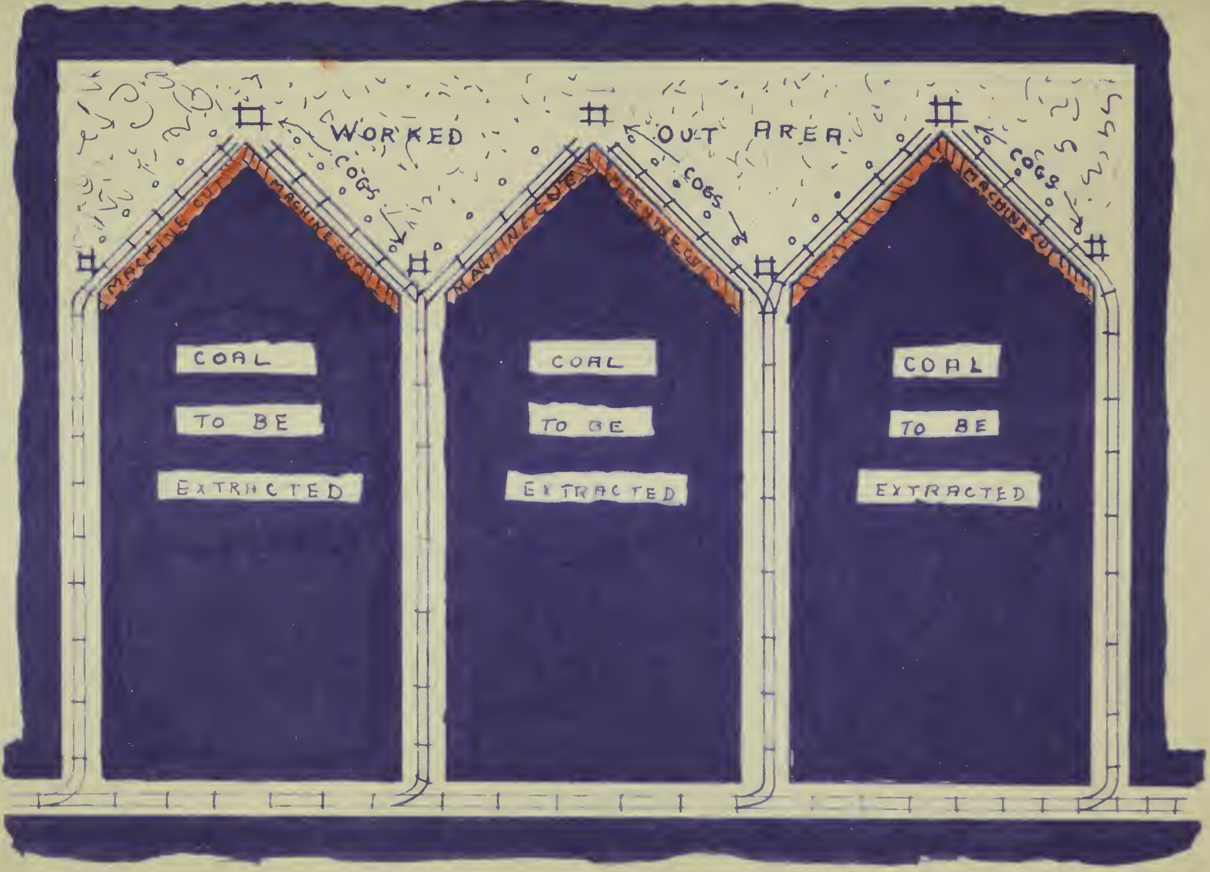


Fig. 1 (b) "Room length" Modification of Long Wall Mining, showing the last machine cut to be taken.

would remain intact for a short time. Another advantage to this method is that it makes possible an extraction of at least 80 % and as high as 95 %. Machine cutting will produce at least 20 % more lump than hand mining. Coal from 55 % to 70 % lump is being mined in the area with machine cutting. The method, according to Stevens (69), lends itself admirably to the use of coal conveyors.

Diagonal Face Slabbing.

This second method is an adaptation of the method used in robbing pillars in the pitching seams of the mountainous districts. Its application to the Edmonton area was suggested by Mr. J. Richards, Inspector of Mines, and Mr. L. C. Stevens, Mining Engineer. It makes use of the principal that the roof is prone to break off in straight lines over areas from whence the coal has been extracted, particularly on the line of support. From this reasoning it is seen that a three point suspension will tend to greater safety. Four rooms may be worked at once. The coal is machine cut on an angle of 45° to the axis of the room as shown in Plate No. 6 . This method provides for a fairly long face for the machine and hence has the long wall characteristics. Similar cuts are run at 45° from the other rooms, and with each successive cut the coal is shot, loaded and the track moved closer to



H H Reach

Plate.6. DIAGONAL SLABBING METHOD OF MINING SHOWING MACHINE CUTS, LOCATION OF TRACK, AND COGS FOR ROOF SUPPORT.

the face. The head end of the entry is protected by batteries or cogs which are placed at intervals along the track remote from the working face. These cogs should be removable so that they may be reconstructed as the face retreats. No timbering is required in the area from which the coal has been extracted. The angular nature of the line of support lessens the possibility of the roof shearing at the face, causing the loss of rails, cutting machines, and of much more serious import, often fatal injury to miners.

The Use of Room Length Slabbing and Diagonal Slabbing Methods in the Edmomton Area

The introduction of coal cutting machines in the Edmonton area led to the change from the room and pillar to the slabbing methods. The room length slabbing method has been used for at least four years in some of the larger mines of the area. The Black Diamond mine uses this method in the winter months and have found that they can easily cope with sudden increases in the demand for lump coal. The Beverly mine has recently adopted this method and have experienced no difficulty in supporting the roof while the room is being worked, whereas the Black Diamond found the roof heavy at times. By the adoption of this method the percentage of extraction is believed to have been increased from 75 to over 85 per cent. It has been reported that the Marcus mine is using this method but it was not seen in operation by the writer.

The diagonal slabbing method has been used in the Nordegg area successfully, but it has been tried only once in the Edmonton area in the old Great West mine. It was abandoned for the room length method, the reason being that longer machine cuts could be taken by the latter method. A saving in time was effected both in re-setting the machine and in timbering as cogs are not required in the room length method. However, the latter method would undoubtedly prove more applicable under heavy roof conditions.

The smaller mines are still using the room and pillar method, but as more machines are introduced into the area room length slabbing will be used more widely.

Development

A conservative program of development work should be done in the summer months for two reasons:

(1) Development work produces a fine sized coal which is more applicable to the summer than the winter market.

(2) It is proportionately more costly to place men on development work when the demand for coal is great as in the winter than to have all hands producing at capacity for the immediate market.

Summer development in the way of blocking off coal and turning room necks for quick removal in winter tends to uniformity in the development and in the number of men employed throughout the year.

Ventilation and Gas.

With few exceptions the forcing system of

ventilation is used during the winter months. The main haulage way is kept warmer and if the tipple is enclosed as is done at the Beverly and Marcus mines the air that has been warmed by its passage through the mine will warm the shaft and lessen the possibilities of wet coal freezing in the chutes.

Gas, largely methane, has been detected in the bore holes to some of the seams below the Clover Bar seam. The 'Lower seam' lying from 27 to 30 feet below the Clover Bar seam has been found to be particularly gassy. It was worked in the Standard mine along with the seam above but was abandoned on account of the large amount of gas, and the seam above was worked alone. As is mentioned elsewhere in this report the close proximity of this seam to the Clover Bar seam made the problem of holding up the roof in the 'Lower seam' nearly impossible and as is pointed out this was a contributory factor in the abandonment of this 'Lower seam'.

Safety lamps were used in the old Great West mine half a mile south of the present Black Diamond as an added precaution against gas. However over the area as a whole the gas seldom reaches ½ of 1 % in the return air in the mines working the Clover Bar seam.

Chapter VII.

THE COAL MINES OF THE EDMONTON AREA

Since 1906 there is record of one hundred and forty mines having been opened in the Edmonton area. Of this number thirty-eight were in operation on December 31, 1933. The following list gives the official number of the mines as recorded with the Chief Inspector of Mines at Edmonton; the owner or lessee and operator; the location of the mine and the manner in which the land is legally held by the owner or lessee.

As much information as could be obtained in regard to the various mines that are either working today or have been abandoned is listed below. Of the one hundred and forty mines that have been opened in the district many of these have been worked seasonally and for a very few years and hence information in regard to them was very difficult, or impossible, to obtain.

This information on the organizations of individual mines has been taken largely from the Annual Reports of the Department of Public Works prior to 1919 and the reports of the Mines Branch from 1920 to date. Geological information is the result of visits to the various mines made during 1933 and 1934.

COAL MINES IN EDMONTON DISTRICT - ACTIVE AND TEMPORARY
#Indicates Subject to Royalty

Mine No.	Lease Pat'd Land Min'l Sale	Owner or Lessee	Operator	Mine Location
#24	Min'l Sale (367)	R. & J. Martin	Hancock-Jones Lbr. Co. Ltd.	LS 14 Sec 20-51-25-4th Mer.
29	Pat'd Short Form	C. & E. Railway	Evan Richards	LS 11 Sec 25-51-25-4th Mer.
43	Pat'd	C. P. Railway	Thompson Bros	N W¼ LS 15 Sec 7-53-23-4th
#69	Min'l Sale (95)	Pres. Church	Keith & Fulton	LS 16 Sec 7-53-23-4th Mer.
90	Pat'd	H. B. Co.	Fraser-Mackay Colliers Ltd.	LS 13 & 14 Sec 8-53-23-4th
91	Pat'd	Edmonton & Saskatchewan Land Co.	Ottewell Coal Co.	SW ¼ Sec 17-53-23-4th Mer.
99	Min'l Sale (235)	W.R. Memberg	Great West Coal Co. Ltd.	SE ¼LS 10 Sec 7-53-23-4th
129	Pat'd	C. P. Railway	L. Parker	LS 16 Sec 23-55-25-4th Mer.
155	Pat'd	John Dowler	Dawson Coal Co. Ltd.	River Lot 25, Rifle Range, Edmonton Settlement.
1429	Pat'd	W. Nicholson	Fairview Coal Co. Ltd.	NE ¼ Sec 30-54-24-4th Mer.

COAL MINES IN EDMONTON DISTRICT - (Continued)

# Indicates Subject to Royalty

Mine No.	Lease Pat'd Land Min'l Sale	Owner or Lessee	Operator	Mine Location
	"Short Form"			
389	Pat'd	Robt. Kelly	Frank Smith	LS 16 Sec 8-55-24-4th Mer.
351	Pat'd	C. P. Railway	F. Chiarello	SW ¼ Sec 25-57-25-4th Mer.
428	Pat'd	Robt. Kelly (Short Form)	Penn Coals Ltd.	LS 10 Sec 8-55-24-4th Mer.
699	Pat'd	H. B. Co.	Marcus Coal Co. Ltd.	LS 15 Sec 8-53-23-4th Mer.
707	Pat'd	James Petrie	Bush Mines Ltd.	River Lot 40, Edmonton Settlement.
869	Pat'd	Jas. Kirkness	Edina Coal Co. Ltd.	River Lot 26, Edmonton Settlement
1034	Pat'd	C. P. Railway	Kost Nimko	LS 11 Sec. 25-51-25-4th Mer
#1091	L2801) L2148	Walter F. Langford	W. E. Gibb	LS 9 Sec 26-51-25-4th Mer.
1098	Pat'd	George L. Long Spec. Grant	J. O Jones	LS 3 Sec 31-54-24-4th Mer.
1099	L2239) L2463)	J. Hutton	John Mather	LS 12 Sec 6-51-25-4th Mer.
1167	Min'l Sale (198)	O.B. & O. H. Bush	Booth Bros.	NW ¼ LS 1 Sec 18--53-23-4th
1229	Pat'd	C. P. Railway	Bon Accord Coal Co Ltd.	LS 9 Sec 3-56-24-4th Mer.

(CARRIED F'D)

COAL MINES IN EDMONTON DISTRICT - (Continued).

# Indicates Subject to Royalty

Mine No.	Lease Pat'd Land Min'l Sale	Owner or Lessee	Operator	Mine Location
1233	"Short Form" Pat'd	C. P. Railway	Mike Sinoski	LS 5 Sec.25-51-25-5th Mer.
1266	Pat'd	Finley Donald (Short Form)	McDonell & Gwillian	LS 14 Sec 36-54-25-4th Mer
1366	Pat'd	W. Stovie	Beverly Ltd.	LS 6 Sec 13-53-24-4th Mer.
1297	Pat'd	H. B. Company	Taken over by W. C. Allen 15/5/33	LS 1 Sec 26-51-25-4th Mer.
1316	Pat'd	Finley Donald (Short Form)	Samis Collieries Ltd.	LS 12 Sec 36-54-25-4th Mer
1321	Min'l Sale (632)	Paul Anve	M.J. Saunders	SW ¼ LS 15 Sec 24-55-25-4
1352	Pat'd	H. B. Company	Steve Poholko	LS 8 Sec 26-51-25-4th Mer.
#1357	Min'l Sale (961)	Orde, Cunliffe & Morrow	Fridel Red Hot Coal Mine	River Lot #33, Edmonton Settlement.
#888	L 5005	Steve Dembiski	Pearson & Branton	N ½ LS 6 Sec 36-50-27-4th
720	Pat'd	C. P. Railway	Rudolph Bros.	LS 13 Sec 5-51-25-4th Mer.
# 1406	L5025	Laverne Garred	Laverne Garred	N ½ LS 4 & 5 Sec 6-58-16-4
1427	Pt'd	----------	Kent Coal Co. Ltd.	SW ¼ Sec 30-52-23-4th Mer.

COAL MINES IN EDMONTON DISTRICT - (Continued)

# Indicates Subject to Royalty

Mine No.	Lease Pat'd Min'l	Land Sale	Owner or Lessee	Operator	Mine Location
#1428	L5096		Alexander Kerr	A. Kerr	LS 16 Sec.24-59-21-4th
1419	Pat'd		C. P. Railway	Robinson & White	LS 4 Sec 2-51-25-4th Mer
#1437	Min'l	Sale	Hilda Tahol	Independent Coal Co.	N ½ LS4 Sec 6-51-25-4th
#1438	Min'l	Sale	Hilda Tahol	Victor Coal Co.	N ½ LS4 Sec 6-51-25-4th

Information on the following mines has been obtained from the Annual Reports of the Mines Branch of the Department of Mines of the Province of Alberta; from mine plans; and from observations on the part of the writer, while visiting these mines.

Mine.	Mine No.	Location.
William Daly	8	W ½, L.S.9, Sec. 7, Tp. 53, R. 23, W. of 4th.
Big Island Coal Company	24	E.½,N.W.¼, Sec.20, Tp.51, R.25, W. of 4th.
J. T. Radford	29	L. S. 11, Sec.25, Tp. 51, R. 25, W. of 4th.
McPeak Coal Company.	49	112th Avenue and 76th Street, Edmonton.
Clover Bar Coal Company	9	L.S.2, Sec. 18, Tp.53, R.23, W. of 4th.
E. N. Richards	29	L.S.11, Sec.25, Tp.51, R.25, W. of 4th.
Great West Coal Company	99	S.E.¼, Sec.7, Tp.53, R.23, W. of 4th.
F. Chiarello	868	L.S.4, Sec.28, Tp.51,R.25, W. of 4th.
R.P.Ottewell	91	S.W.¼, R.17, Tp.53, R.23, W. of 4th.
Keith & Fulton	69	L.S.16, Sec.7, Tp.53, R.23, W. of 4th.
Fraser McKay Collieries Ltd.	90	L.S. 12, Sec.8, Tp.53, R.23, W. of 4th.
Humberstone Mines Ltd.	43	L.S.15, Sec. 7, Tp.53, R.23, W. of 4th.
Bush Coal Company	46	River Lot 42, Edmonton.

Mine	Mine No.	Location
Dawson Coal Company	155	River Lot 23, Edmonton
Edmonton Collieries Ltd.	147	River Lots 18 and 20, Edmonton.
Twin City Coal Company	177	River Lot 17, Edmonton.
Penn Mine Coal Company	632	River Lot 20, Edmonton.
Reed and Brown	869	River Lot 20, Edmonton.
Kost Nimko	1034	L.S. 11, Sec. 25, Tp.51, R. 25, W. of 4th.
John Mather	1087	River Lot 40, Edmonton.
Thomas Mather	1104	N.E.¼, Sec.36, Tp.52, R. 24, W. of 4th.
George and Harry Booth	1167	L.S.1, Sec.18, Tp.53, R. 23, W. of 4th.
W. E. Gibbs	1091	L. S. 9, Sec. 28, Tp.51, R. 25, W. of 4th.
Marcus Coal Mines Ltd.	699	L.S. 15, Sec.8, Tp.53, R. 23, W. of 4th.
Thomas Nearney	877	N.W.¼, Sec.25, Tp.51, R. 25, W. of 4th.
Bush Mines Ltd.	707	River Lot 40, Edmonton.
Dominic Falvo	922	L.S.5, Sec. 28, Tp.51, R. 25, W. of 4th.
North American Collieries Ltd.	267	N.W.¼, Sec.28, Tp.52, R. 25, W. of 4th.
Forte, Allan and Jackson	397	S.E.¼, Sec.8, Tp.55, R. 24, W. of 4th.
Schallert and Youngberg	645	S.W.¼, Sec.6, Tp.55, R. 24, W. of 4th.
Penn Coals Lts.	428	L.S.15, Sec.8, Tp.55, R. 24, W. of 4th.
Hardite Coal Company	1098	L.S.3, Sec. 31, Tp.54, R. 24, W. of 4th.

Mine	Mine No.	Location
Canadian Coal Company, Ltd.	32	L.S.11, Sec.24, Tp. 55, R. 25, W. of 4th.
Charles Morris	1113	River Lot 42, Tp.54, R.25, W. of 4th.
McKen and Seale	1168	Block A, Tp.53, R.26, W. of 4th.
Levi Parker	129	L.S.16, Sec. 23, Tp.55, R. 25, W. of 4th.
Parkdale Mine		N. E.¼. River Lot 26, Edmonton.
Kent Coal Company	1427	S.W.¼, Sec.30, Tp.52, R.23, W. of 4th.
Premier Mine	869	River Lot 28, Edmonton.
Beverly Mine	1366	S.W.¼, Sec.13, Tp.53, R. 23, W. of 4th.
Frank Mine		River Lot 31, Edmonton.
Red Hot Mine	1357	River Lot 34, Edmonton.

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WILLIAM DALY (MINE NO. 8)

Mine Office: Clover Bar.
Overman: J. Hehterington.
Mine Surveyor: Norman Fraser.
Location: W ½ L. S. 9 Sec. 7 Tp 53 Rge 23 W of 4th.
Area: 15 acres. Character: Lignite.
Owner of Property: William Daly, Clover Bar.

The Clover Bar seam was worked by a drift from the bank. The coal is uniformly 6 feet thick with no bone beds. It is gray in appearance resembling that of the Humberstone across the river and the Fraser McKay. It should be noted that the coals of these mines mentioned differ greatly in lustre from the coals of the Dawson, Old Penn and Red Hot. The former mines are near the centre of the basin, whereas the latter are close to the shoreline.

BIG ISLAND COAL COMPANY. (MINE NO. 24)

Location: E ½ of N. W. ¼ Sec. 20 Tp 51 Reg 25 W of 4th.
Mine Office: 10502 98 St. Edmonton.
Overman: John Molley.
Mine Surveyor: Norman Fraser.
Area: 52 acres. Character: Lignite.
Owner of Property: Wetaskiwin Coal Company.

This mine was a drift into the bank of the river. The seam (the Big Island) is from 4½ to 5 feet in thickness. The mine has not been worked in the last 5 years.

J. T. RADFORD. (MINE NO. 29)

Mine Office: Ellerslie
Head Office: Edmonton South, Edmonton.
Overman: J. Walsh.
Mine Surveyor: F. B. Smith

J. T. RADFORD. (MINE NO. 29 continued)

Location: L. S. 11 Sec. 25 Tp 51 Rge 25 W of 4th
Area: 640 acres. Character: Domestic.
Owner: White Star Coal Company, Edmonton South.

This mine was operated on White Mud Creek in the Big Island seam. The mine has been abandoned.

MCPEAK COAL COMPANY. (MINE NO. 49)

Mine Office: 112 Ave. & 76 St.
General Manager: P. J. McPeak.
Overman: H. Hunter.
Mine Surveyor: David Jones.
Location: River lot 26.
Area: 35 acres. Character: Domestic.
Owner of Property: Kirkness Estate, Edmonton.

Both the Clover Bar and Lower seams were worked in this mine. The latter was gassy and due to its proximity (30 feet) to the Clover Bar seam caving set in and the Lower seam was abandoned. This No. 5 seam has been reported in the shaft but of very small thickness. This mine has not been worked since 1923. It is now probably flooded.

CLOVER BAR MINE COAL COMPANY. (MINE NO. 9)

Mine Office: Beverly.
Manager: Geo. H. Bilson.
Mine Surveyor: L. C. Stevens.
Location: L. S. 2, Sec. 18 Tp 53 Rge 23 W of 4th.
Area: 815 acres. Character: Domestic.
Thickness of Seam: 7 feet.
Thickness of Cover: 70 feet.

The Clover Bar seam was mined by a vertical shaft 85 feet deep. The coal was 7 feet thick. In

places this coal had a gravel roof and to the north the coal was cut off abruptly by a washout, which is now known to continue west as far as the Beverly Mine.

The coal on the western side of the property was "speckled" due to the deposition of carbonate salts in the cleavage planes. Some"curly"coal was found throughout the seam. This mine was abandoned in 1923.

E. N. RICHARDS. (MINE NO. 29)

Location: L. S. 11 Sec. 25 Tp 51 Rge 25 W of 4th.
Mine Office: Edmonton South.
Overman: E. N. Richards.
Mine Surveyor: L. C. Stevens.
Location:
Area: 40 acres. Character: Domestic.
Thickness of Seam: 5 feet.
Thickness of Cover: 115 feet.

This mine was not visited during this investigation.

GREAT WEST COAL COMPANY, LIMITED. (MINE NO. 99)
(Black Diamond Mine)

Location: S. E. ¼ Sec. 7 Tp 53 Rge 23 W of 4th.
Mine Office: Clover Bar.
Head Office: 10126 101A Avenue
Authorized Capital: $150,000.00
President: J. C. Dunn.
Directors: W. S. Cupples, J. C. Dunn, A. C. Dunn.
Secretary-Treasurer: T. S. Campbell.
Manager and Mine Surveyor: Wm. Wilson.
Overman: Terrence Smith.
Examiners: R. McAndrew, James Chalmers.
Area: 1118 acres. Character: Domestic.
Thickness of Seam: 6½-7 feet.
Thickness of Cover: 160 feet.

GREAT WEST COAL COMPANY, LIMITED. (Continued).

The Clover Bar seam is mined by a slope from the plain above the river.

This seam outcrops along the river at low water level with a thickness of 6 feet. This thickness is found throughout most of the workings but to the south and particularly in the old Great West Mine ¼ mile south of the present slope the coal thins to 4 feet. West of this shaft the coal is less than 2 feet. The Weaver seam with a thickness of about 1 foot is encountered about 20 feet from the surface and No. 5 seam also very thin, is seen. The Lower seam lies 30 feet below the Clover Bar. The thickness has been recorded as 4 feet. The dip is approximately 25 feet to the mile to the southwest. Several rolls are known to occur in the property. They are between 100 and 200 feet in diameter and have displaced the coal in places as much as 6 feet vertically. Endless chain haulage is used on the slope. Electric coal-cutting machines are used. The "slabbing" method of extraction has been tried recently with considerable success.

F. CHIARELLO. (MINE NO. 868)

Location: L. S. 4 Sec. 28 Tp 51 Rge 25 W of 4th.
Mine Office: R. R. No. 3 Strathcona. (White Mud Creek
Overman: F. Chiarello.
Mine Surveyor: D. Jones.
Area: 80 acres. Character: Domestic.

F. CHIARELLO. (MINE NO. 868 continued)

Thickness of Seam: 5 feet.
Thickness of Cover: 100 feet.

This mine has been abandoned for at least four years.

R. P. OTTEWELL. (MINE NO. 91)

Location: S. W. ¼ Sec. 17 Tp 53 Rge 23 W of 4th.
Mine Office: Clover Bar.
Overman: W. J. Ottewell.
Mine Surveyor: L. C. Stevens.
Area: 140 acres. Character: Domestic.
Thickness of Seam: 6 feet.
Thickness of Cover: 80 feet.

Only the Clover Bar seam is mined in this mine. The No. 5 seam appears in the shaft about 25 feet down. The Clover Bar dipping to the southwest, thins to the north in the outcrop. "Rolls" have been encountered but not to the same extent as in the Black Diamond Mine. The Lower seam, with a thickness of 2½ feet was found when the piers were placed for the Clover Bar Bridge just to west of the Ottewell property.

KEITH & FULTON. (MINE NO. 69)

Mine Office: Clover Bar.
Overman: J. Hutton.
Mine Surveyor: L. C. Stevens.
Location: L. S. 16 Sec. 7 Tp 53 Rge 23 W of 4th.
Area: 40 acres. Character: Domestic.
Thickness of Seam: 7 feet, Clover Bar Seam.
Thickness of cover 9 to 100 feet.

This mine is practically worked out. The seam outcrops along the river and its thickness is quite

uniform.

Fulton started a prospect to the Clover Bar seam on the river bank at the north end of River Lot No. 45 but the coal was only ½ foot thick, and the prospect was abandoned in the summer of 1933.

The dip is to the southwest. The coal is grey in appearance resembling the coal of the Beverly and Humberstone Mines.

FRASER MCKAY COLLERIES LIMITED. (MINE NO. 90)

Mine Office: Clover Bar.
Head Office: 10055 101 St.
Authorized Capital: $20,000.00
President: Norman Fraser.
Vice-President & General Manager: W. C. McKay.
Manager & Mine Surveyor: Norman Fraser.
Overman: L. Dalziel.
Location: L. S. 12 Sec. 8 Tp 53 Rge 23 W of 4th.
Area: 160 acres. Character: Domestic.
Thickness of Seam: 7 feet, Clover Bar Seam.
Thickness of Cover: 100 feet.

The coal is quite uniform in the Clover Bar seam. It is reached by a shaft 101 feet deep. This seam passes through the Weaver seam and the No. 5 seam, both of which are much less than a mineable thickness. "Rolls" occur in this mine. The dip is gently to the southwest. The coal is more grey than lustrous.

HUMBERSTONE MINES LIMITED. (MINE NO. 43)

Mine Office: Beverly.
Authorized Capital: $30,000.00
President: G. H. Bilson.
Vice-President: C. E. Laderoute, K. S. Campbell.
Secretary: H. S. Southgate.
Manager: Norman Fraser.
Mine Surveyor: R. H. Cautley.
Overman: Thomas Adams.
Location: L. S. 15 Sec. 7 Tp 53 Rge 23 W of 4th.
Area: 200 acres. Character: Domestic.
Thickness of Seam: 7 feet.
Thickness of Cover: 50 to 125 feet.

Although the main mine has been abandoned for nearly ten years, several small workings have been carried on "robbing the pillars".

The thickness of the seam (the Clover Bar) is uniformly seven feet and in one area went as high as eight and one-quarter feet. The coal is grey in appearance, little or no shiny bands in it.

The writer considers this mine to be very close to the centre of the basin.

BUSH MINE COAL COMPANY. (MINE NO. 46)

Mine Office: Beverly.
Authorized Capital: $45,000.00
President: C. E. Laderoute.
General Manager: H. S. Southgate.
Superintendent: K. S. Campbell.
Manager and Mines Surveyor: Norman Fraser.
Secretary-Treasurer: H. S. Southgate.
Overman & Examiner: R. Hedges.
Location. River Lot 42 Edmonton Settlement.
Area: 210 acres. Character: Domestic.
Thickness of Seam: 4 feet 6 inches.
Thickness of Cover: 50 to 120 feet.

This mine is to be distinguished from the

Bush Mine operating today. This mine lies to the east of the present Bush. This mine was abandoned in 1925 or 1926.

THE DAWSON COAL COMPANY, LIMITED. (MINE NO. 155).

Location: River Lot 25 Edmonton Settlement.
Head Office: McDougall Court Edmonton.
Authorized Capital: $30,000.00.
General Manager & Secretary-Treasurer: C. A. Hyndman.
Mine Surveyor: L. C. Stevens.
Manager: R. H. Watson.
Overman: D. Muir.
Area: 160 acres. Character: Domestic.

Four seams are known on the property. The Weaver seam is seen with a thickness of 3 feet on the hill above the shaft. It has its small lump characteristics. The No. 5 seam from 2 to 3 feet in thickness and is 20 feet below the top of the shaft. At 114 feet the Clover Bar seam is reached. The coal is 5 feet thick at the shaft but thins to 4 feet at the south boundary of the property. The bone beds in the centre of the seam increase from 3 inches at the shaft to 1 foot at the south end of the property. Twenty-seven feet below the Clover Bar seam the Lower seam has been reached by drilling. It is 2½ feet thick and thins to the south. The coal from the Clover Bar seam is lustrous, resembling the coal from the Old Penn mine. The dip is to the northwest, and is about 15 feet per mile.

EDMONTON COLLIERIES LIMITED. (MINE NO. 147)
(CHINOOK MINE)

Location: River Lots 18 and 20 Edmonton Settlement.
Mine Office: 92 St. Fraser Flats, Edmonton.
Head Office: 10206 103 St., Edmonton.
Authorized Capital: $50,000.00.
President & General Manager: C. W. Rickard.
Secretary-Treasurer: C. W. Leonard.
Overman: J. Brown.
Mine Surveyor: D. Jones.
Character: Domestic.
Thickness of Seam: 6 feet to 3½ feet at the north end.

This mine was operated by the Penn Coal Company from 1926 until 1930.

All workings were in the Clover Bar seam. The Lower seam 30 feet below was 4 feet thick but was not worked. The coal is lustrous and resembles that of the Old Penn Mine. The dip is to the southeast but not more than 12 feet per mile.

TWIN CITY COAL COMPANY, LIMITED. (MINE NO. 177).

Mine Office: Edmonton South.
Head Office: Toronto, Ontario.
Authorized Capital: $600,000.00.
President: R. L. McIntyre.
Directors: R. L. McIntyre, J. H. McGregor, O. Baird,
J. Sinclair, J. A. Morden, H. C. Anderson.
Secretary: J. Sinclair.
General Manager: H. C. Anderson.
Manager: L. C. Stevens.
Overman: R. Rawlinson.
Examiners: W. Foster, R. Graham.
Mines Surveyor: L. C. Stevens.
Location: Block F. River Lot 17 Edmonton Settlement.
Area: 367 acres. Character: Lignite.
Owner: Twin City Coal Company, Limited, Toronto. Ont.

The shaft is 130 feet to the Clover Bar seam. Mr. Stevens reports that the Lower Seam at a further

TWIN CITY COAL COMPANY, LIMITED. (Continued)

distance of 29 feet was also worked. The Weaver seam (2 feet thick) and No. 5 seam (1½ feet thick) were passed through in sinking the shaft, but were not mined. The Clover Bar seam thinned to the south quite rapidly from nearly 5 feet to 3 feet 2 inches. The bone partings having increased greatly. The dip is to the northwest at about 15 feet to the mile. The coal resembles that of the Dawson Mine.

The mine has been abandoned since 1928.

PENN MINE COAL COMPANY, LIMITED. (MINE NO. 632)

Location: River Lot 20 Edmonton Settlement.
Mine Office: 10631 92 st., Edmonton.
Head Office: 10351 82 St., Edmonton.
Authorized Capital: $50, 000.00.
President: James Dowdell.
Directors: J. H. Starky, A. N. Singleton, J. H. Dowdell.
General Manager: J. H. Starky.
Manager & Overman: Jas. Clyne.
Mine Surveyor: D. Jones.
Area: 130 acres. Character: Domestic.
Owner of Property: Dept. of Justice, Ottawa.
Examiners: W. Worthington, J. Hutchinson, D. Thomson.

This mine was abandoned in 1931.

Four seams were known to exist on the property. The 247 feet shaft passed through the Weaver seam (3 feet 4 inches) and the Middle seam (2 feet) (?) to the Clover Bar seam. The thickness of the Clover Bar seam was 5¼ feet at the shaft but thinned to 4 feet and in places to 3 feet 7 inches at the extreme north of the property. The coal is lustrous having broad bands of vitrain.

PENN MINE COAL COMPANY LIMITED. (Continued)

alternating with the duller bands. The dip according to Mr. D. Jones, Mine Surveyor, is about 15 feet to the mile to the southeast by south.

REED & BROWN. (MINE NO. 869)

Thickness of Seam: 5 feet.
Thickness of Cover: 70 to 200 feet.
Mine Office: 74 St. & 109 Ave.
President & Manager: Thomas. F. Brown.
Examiner: S. G. Collins.
Mine Surveyor: L. C. Stevens.
Location of Mine: River lot 20 Edmonton Settlement.
Area: 80 acres. Character: Domestic.

This mine was operated by the Penn Coal Company until 1930. The Clover Bar seam was the only seam mined.

KOST NIMKO. (MINE NO. 1034)

Mine Office: 10338 Whyte Avenue, Edmonton.
Overman: K. Nimko.
Mine Surveyor: L. C. Stevens.
Location: L. S. 11 Sec. 25 Tp 51 Rge 25 W of 4th.
Area: 40 acres. Character: Domestic.
Thickness of Seam: 4 feet.
Thickness of Cover: 10 to 115 feet.

This mine is operated at White Mud Creek. A drift has been driven into the Big Island seam.

JOHN MATHER. (MINE NO. 1087)

Mine Office: Beverly.
Location: River Lot 40 Edmonton Settlement.
Character: Domestic.

This mine is abandoned.

THOMAS MATHER. (MINE NO. 1104)

Mine Office: Edmonton.
Location: N. E. ¼ Sec. 36 Tp 52 Rge 24 W of 4th.
Area: 40 acres. Character: Domestic.

This mine has been abandoned for at least 5 years.

GEORGE & HARRY BOOTH. (MINE NO. 1167)

Mine Office: Clover Bar.
Overman: Harry Booth.
Location: L. S. 1 Sec. 18 Tp 53 Rge 23 W of 4th.
Area: 30 acres. Character: Domestic.

This mine was entered by a drift driven in from the river band into the Clover Bar seam. The workings of the old Clover Bar mine were encountered. A parting of clay 2 inches thick at the river bank increased to 8 inches 250 feet west. The coal at the west face has 3½feet for a bottom bench, 8 inch parting and 2 feet upper bench. This mine was not operated after 1933.

W. E. GIBBS. (MINE NO. 1091)

Mine Office: R. R. No. 3 Strathcona.
Location: L. S. 9 Sec. 26 Tp.51 Rge 25 W of 4th.
Overman: Walter Talbot.
Thickness of Seam: 5 feet.

This mine is just west of the Kost Nimko Mine. It is also a drift into the Big Island seam. The dip of the strata in these two mines is to the southwest, but not more than 25 feet to the mile. These mines were operated last winter.

MARCUS COAL MINES, LIMITED. (MINE NO. C99)

Location: L. S. 15 Sec. 8 Tp 53 Rge 23 W of 4th.
Mine Office: Clover Bar.
Head Office: McLeod Building, Edmonton.
Authorized Capital: $20, 000.00.
President: R. L. McIntyre.
Secretary-Treasurer: J. I. Mann.
Manager: A. Crawford.
Mine Surveyor: D. Jones.
Area: 400 acres. Character: Domestic.
Thickness of Seam: 6 feet.
Thickness of Cover: 125 feet.

The Marcus Mine is the furthest east of the working mines of the area. The Clover Bar seam is worked. The thickness is 5 feet at the shaft bottom, but thins slightly to the northeast, and thickens to the southeast. The dip is to the southwest at about 22 feet per mile. This mine, like the Black Diamond and Ottewell has a railway spur track. The Weaver seam is not recognisable in the shaft.

THOMAS NEARNEY. (MINE NO. 877)

Mine Office: 10747 75 Avenue, Edmonton.
Overman: T. Nearney.
Mine Surveyor: L. C. Stevens.
Mine Location: N. W. $\frac{1}{4}$ Sec. 25 Tp 51 Rge 25 W of 4th.
Area: 20 acres. Character: Domestic.
Thickness of Seam: 5 feet.
Thickness of Cover: 100 feet.

This mine was a drift into the Big Island seam from the bands of White Mud Creek.

The mine has been abandoned.

BUSH MINES, LIMITED. (MINE NO. 707)

Location: River Lot 40 Edmonton Settlement.
Mine Office: Beverly.
Overman: K. S. Campbell.
Manager: C. J. Ferguson.
Mine Surveyor: L. C. Stevens.
Character of Coal: Domestic.
Thickness of Seam: $4\frac{1}{2}$ feet.
Thickness of Cover: 95 feet.

The Clover Bar seam is mined. The thickness decreases rapidly to the south and southwest to 3 feet 5 inches. It outcrops on the river just at low water level. There seems to be an area of non-deposition to the west and southwest of the property. To the north the coal increases to 5 feet and is dull grey in colour, not being particularly lustrous.

Weaver seam is seen halfway down the shaft with a thickness of $2\frac{1}{2}$ feet.

Coal is hauled entirely by trucks and teams (from the mine) there being no railroad connections.

DOMINIC FALVO. (MINE NO. 922)

Mine Office: R. R. No. 3, Strathcona.
Overman: D. Falvo.
Location: L. S. 5 Sec. 28 Tp 51 Rge 25 W of 4th.
Area: 40 acres. Character: Domestic.

This mine was a drift into the Big Island seam at Big Island.

The coal is 5 feet thick and dips slightly to the west. The mine is not worked at the present time.

NORTH AMERICAN COLLIERIES, LIMITED. (MINE NO. 267)

Mine Office: St. Albert.
Head Office: 1021 Transportation Building, Montreal.
Authorized Capital: $1,000,000.00.
President: H. A. Lovett K. C.
Vice-President: Hon. R. McKay, Parmely Herrick.
Directors: H. A. Lovett K. C., Hon. N. Curry, Hon. R. McKay, P. W. Herrick, R. M. Ballantyne, J. N. Greenshield, J. W. Pyke, J. B. Ferguson.
Secretary: F. P. Brown, Assistant: S. T. Mains.
General Superintendent: N. C. Pitcher.
Manager: Thomas O'Donnell.
Overman: William Allen.
Mine Surveyor: Thomas O'Donnell.
Location: N. W. ¼ Sec. 28 Tp 53 Rge 25 W of 4th.
Area: 1100 acres. Character: Lignite.
Owner of Property: North American Collieries, Montreal.

Great difficulty was experienced in sinking the shaft, due to the quicksand.

The reader is referred to Doty's paper (53) of 1916 for a complete description of this feat of engineering. Three seams were encountered. A 2 foot seam at 210 feet from the top of the shaft. Seven feet of very dirty coal at 320 feet. This latter seam is considered to be the Clover Bar seam.

This mine was abandoned in 1916.

PORTE, ALLEN & JACKSON. (MINE NO. 397)

Mine Office: Namao.
Head Office: 416 McLeod Building.
Manager: A. N. Scott.
Location: S. E. ¼ Sec. 8 Tp 55 Rge 24 W of 4th.
Area: 160 acres. Character: Lignite.
Owner of Property: Mrs. E. Kelly, Namao.

This mine was in the Sturgeon valley, but

PORTE, ALLEN & JACKSON. (Continued)

since it has been abandoned for nearly 10 years further information in regard to the coal was not obtainable.

SCHALLERT & YOUNGBERG. (MINE NO. 645)

Mine Office: Namao.
Head Office: General Delivery, Edmonton.
Overman: Antoine Alphonse Avigon.
Location: S. W. ¼ Sec. 6 Tp 55 Rge 24 W of 4th.
Area: 160 acres. Character: Lignite.
Owner of Property: John T. Flynn, Namao, Alberta.

This mine is abandoned.

PENN COALS LIMITED. (MINE NO. 428)

Location: L. S. 15 Sec. 8 Tp 55 Rge 24 W of 4th.
Mine Office: Namao.
General Manager: J. B. Starky.
Mine Surveyor: D. Jones.
Manager: Jas. Clyne.
Area: 100 acres. Character of Coal: Domestic.
Thickness of Seam: 5 feet.
Thickness of Cover: 75 feet.
Overman: W. Worthington.

The seam mined has the characteristics of the Clover Bar seam and is in the same horizon. It is impossible at present to make a definite correlation. One hundred ten feet below the seam worked another 5 foot seam of good coal has been proven up. This seam is not worked, at present. The mine is well equipped and has produced as high as 800 tons a day.

HARDITE COAL COMPANY. (MINE NO. 1098)

Mine Office Namao.
Overman: Jas. Thomson.
Location: L. S. 3 Sec. 31 Tp 54 Rge 24 W of 4th.
Area: 20 acres. Character: Domestic.

This mine was operated last year, but has not been visited.

CANADIAN COAL COMPANY, LIMITED. (MINE NO. 32)

Mine Office: Cardiff.
Head Office: 206 Quebec Bank Building, Edmonton.
Authorized Capital: $250,000.00.
President: W. S. Campbell, Edmonton.
Vice-President: E. J. Mahar, Edmonton.
Secretary-Treasurer: L. A. Leonard.
Manager & Mine Surveyor: D. Jones.
Overman: W. Gillisland.
Location: L. S. 11 Sec. 24 Tp 55 Rge 25 W of 4th.
Area: 630 acres. Character: Domestic.
Thickness of Seam: 5 to 10 feet.
Thickness of Cover: 40 feet.

This mine has been abandoned for some time. It was started since 1902.

CHARLES MORRIS. (MINE NO. 1113)

Mine Office: 9343 101 A Avenue, Edmonton.
Location: River Lot 42, Tp 54 Rge 25 W of 4th.

This mine was abandoned in 1923.

MCKEN & SEALE. (MINE NO. 1168)

Mine Office: St. Albert.
Overman: P. Kinpers.
Location: Block A, Tp 53 Rge 26 W of 4th.

A slope has been started but has not reached the coal and the mine has not been in operation since 1924.

LEVI PARKER. (MINE NO. 129)

Mine Office: Cardiff.
Mine Surveyor: L. C. Stevens.
Overman: L. Parker.
Location: L. S. 1[illegible] Sec. 23 Tp 55 Rge 25 W of 4th.
Area: 320 acres. Character: Domestic.
Thickness: 16 feet.
Thickness of Cover 40 feet.
Owner of Property: Alberta Coal Mining Company, Edmonton.

This mine is working the area once worked as a strip mine by the Alberta Mining Company. The coal dips gently to the southwest.

A washout running east and west is known to occur about ¼ mile south of this property. The full extent of the washout is not known.

PARKDALE MINE.

Location: N. E. Cr. of R. L. 26, Edmonton.

This mine has not been operated for about 22 years. The coal (Clover Bar seam) is 4 feet thick at the shaft but thins to less than 3 feet 600 feet to the north and northeast. The Lower seam has a thickness of 4 feet at the shaft and lies 33 feet below the Clover Bar seam. This Lower seam was worked along with the Clover Bar seam for a while but gas and cavings forced the company to abandon the Lower seam.

The coal is lustrous with good cleavage. The mine is close to the north shore line of the basin. The dip is about 25 feet to the mile to the sourth or southeast by south.

THE KENT COAL COMPANY. (MINE NO. 1427)

Location: S. W. ¼ Sec. 30 Tp 52 Rge 23 on the Chamberlin property.

Weaver and Clarke sunk a shaft to the Clover Bar seam, a depth of 157 feet. Great difficulty was encountered in sinking the shaft due to quicksand.

The mine is now operated by Mr. J. Starky.

The Clover Bar seam is 6 feet thick. The Weaver seam with a thickness of 3 feet was encountered at a depth of 77 feet and the seam which is probably the No. 5 seam (5 feet thick at 120 feet). The coal dips to the northwest.

PREMIER MINE. (MINE NO. 869)

This mine is located on R. L. 28 and is operated by Mr. J. Dowdell.

The Clover Bar seam is reached by a 74 foot vertical shaft. The coal is 5 feet 1 inch thick at the shaft bottom. There is little or no dip. The coal has broad bands of bright coal alternating with layers of grey coal. The basin is narrow around this and the Penn, Dawson and Red Hot Mines. The Premier is considered to be in about the centre of the neck.

BEVERLY MINE. (MINE NO. 1366)

Location: S. W. ¼ Sec. 13 Tp 53 Rge 23 W of 4th.

The Clover Bar seam with a uniform thickness

BEVERLY MINE. (MINE No. 1366 Continued)

of 5 feet 10 inches of coal, is mined. The shaft is 148 feet deep. The roof is good, and the "slabbing" system of mining is being used. The coal is uniformly grey except for the 1 foot of coal which is left for a roof. This coal is particularly lustrous indicating the closing phases of the sedimentation in the basin. The washout encountered in the Clover Bar mine has been run into on the north side of this property and the Clover Bar seam has been eroded away.

The dip varies from 18 feet to 35 feet to the mile to the southeast.

Several patches of "curly" coal have been found in the seam. These areas will be as large as 400 feet square.

FRANK MINE.

Location: Northern part of R. L. 31, Edmonton.

The Clover Bar seam was mined. The thickness of the coal is 4 feet 8 inches decreasing slightly to the southeast, where it becomes boney.

The Lower seam is known to exist with a thickness of 22 inches but was not mined. The dip is very small and is to the northwest.

The mine is near the southern boundary of the basin. The mine has been abandoned for nearly 10 years.

THE RED HOT MINE. (MINE NO. 1357)

Location: R. L. 34. 33?

The Clover Bar seam is mined from a slope driven in the creek bank. The coal is 5 feet 1 inch at the slope bottom with no bone or clay partings. The partings are found to develop and increase to the southeast, where they are 18 inches thick, the coal being 1½ feet on the top bench and 2 feet on the bottom. Drilling has shown the coal to thin to less than 2 feet at the south end of the property . Drillings recently completed show the Lower seam at 29 feet below the Clover Bar but of a thickness of less than 1 foot.

The Weaver seam outcrops with a thickness of 3 feet in the bank above the mine opening.

The No. 5 seam is found half-way down the slope and of 2 feet 2 inches in thickness.

The dip is very gentle and to the northwest. This mine is considered to be near the south shore line of the basin. The coal is particularly lustrous.

Chapter VIII

PRODUCTION AND RESERVE

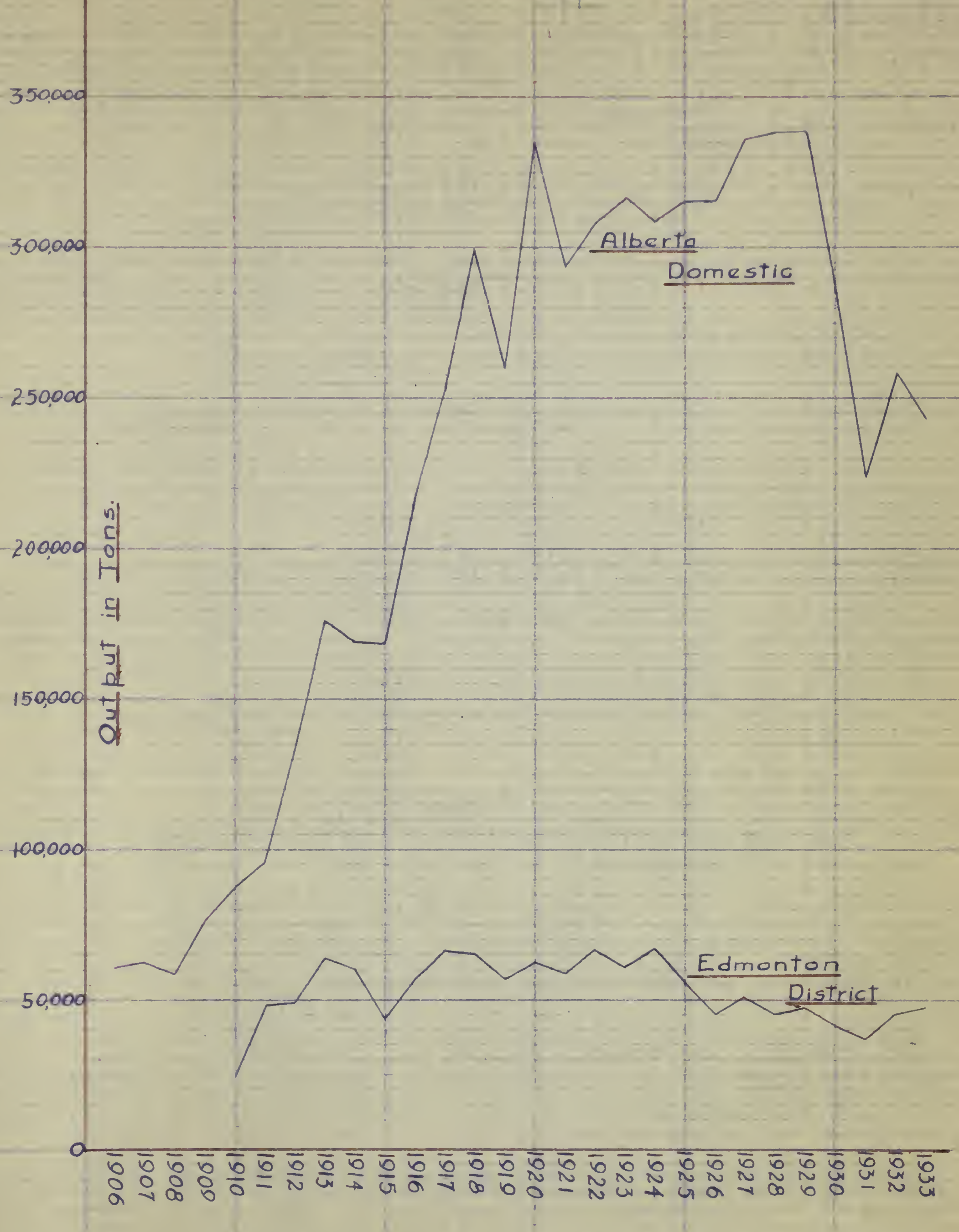
Output

The Edmonton coal area produces the second largest tonnage of any domestic field in Alberta, being exceeded only by the Drumheller field. Before the year 1906, mines or any data in regard to their operation were not required by law to be recorded with the North West Territories government, then situated at Regina. No figures on yearly tonnage for the Edmonton district are available before 1910. The following list is the official recording of the tonnages from the year 1910 to date. That a comparison may be drawn, the total tonnages of the domestic coal mines for the whole province is also given. The graph on the next page is a comparative plot of these figures:

YEAR	EDMONTON	DOMESTIC (Alberta)
1906	....	602,780
1907	....	639,335
1908	....	584,334
1909	....	763,673
1910	248,911	878,011
1911	485,263	964,700
1912	491,767	1,341,389
1913	640,044	1,763,225
1914	602,903	1,697,401
1915	442,634	1,682,922
1916	565,265	2,172,801
1917	661,241	2,537,829
1918	659,426	3,035,061
1919	573,272	2,605,715
1920	632,438	3,352,417

Plate No. VII

Chart Showing Alberta and Edmonton Domestic Coal Production.



YEAR	EDMONTON	DOMESTIC (Alberta)
1921	593,823	2,933,220
1922	664,428	3,086,692
1923	616,247	3,161,741
1924	675,285	3,096,660
1925	558,710	3,156,359
1926	459,035	3,160,029
1927	513,256	3,557,171
1928	452,671	3,378,200
1929	476,702	3,385,749
1930	417,310	2,874,090
1931	370,252	2,246,544
1932	454,293	2,576,831
1933	477,791	2,434,047

The piping of natural gas to Edmonton as a competitive fuel in 1923 will account for the decline in production since 1924.

Production for the year is at its peak during the winter months. Changes of weather show a corresponding change in the amount of coal sold. The following figures taken from the 1932 Annual Report of the Department of Lands and Mines of Alberta (51) serve to show the seasonal fluctuation:

January	64,709 tons	July	9,422 tons
February	63,891 "	August	14,814 "
March	45,512 "	September	28,780 "
April	20,097 "	October	57,345 "
May	14,496 "	November	60,912 "
June	11,894 "	December	62,421 "

At current prices (1934) coal gives more heat units dollar for dollar than does natural gas. The ease with which the latter may be used warrants its utilization in many cases. Recent developments

in hopper fed self-stoking furnaces, using a fine-sized coal, may find favor with householders now using gas. Several of these **stokers** are being tried in Edmonton and are proving their worth due to their ease of manipulation and low cost of operation.

Reserves

The estimation of reserves of coal in any coal area is at best a hazardous approximation. Once the stratigraphical succession is known in an area it is likely that the first calculation of the probable tonnage will be the most liberal. Further prospecting will undoubtedly prove up areas of non-deposition or areas of post-depositional erosion not manifest on the surface of the ground. These factors will tend to lower the estimates over the area in which they occur.

In an area of 14 square miles extending from Clover Bar to 109 Street along the river for about one mile on either side Dr. Dowling estimated 80,000,000 tons, assuming the information that was available to him in 1909. The writer, using the information to date and Dr. Dowling's method of calculation estimates the reserves at 45,500,000 tons.

The discrepancy in the latter estimate is based on the following points of reasoning:

(1) Of the 14 square miles, more than 2 square

miles have recently been proven barren of coal; due either to the existence of areas of non-deposition or that the coal has been removed in "washouts" or areas of post-depositional erosion.

(2) Mining practice in this area makes possible about 50 per cent extraction and in many cases this figure is not attained.

(3) In working a coal lease in the area considered, the operator has to choose whether he will work the Clover Bar seam or the "Lower seam" lying 27 feet below. Experiments carried on in the Twin City Mine and the Standard Mine of working both seams prove that it is next to impossible, under present methods of mining. Hence all of the coal shown in the stratigraphical section cannot be considered as probable reserves at present.

(4) Water and running sand conditions have made shaft sinking very difficult and it is questionable whether the resulting tonnage will justify the original expenditure, in parts of the area.

(5) Extraction has been continuous since Dowling's estimate was made and at least 3 square miles of the coal have been removed or made unavail-

able due to faulty development work since 1909.

Upon first consideration one is prone to assume that our coal supply is half exhausted. One must remember, however, that this area taken for a comparative example is the most widely worked part of the whole Edmonton area and yet a small part of the total expanse under which coal is known to occur. Bored holes to the northwest of Edmonton in the vicinity of St. Albert show the Clover Bar seam to have a thickness of 7 feet over a considerable area. This part of the district has not been mined to any extent. This horizon is known to extend north at least as far as Morinville where thicknesses of as much as 14 feet of coal have been reported as a result of drilling.

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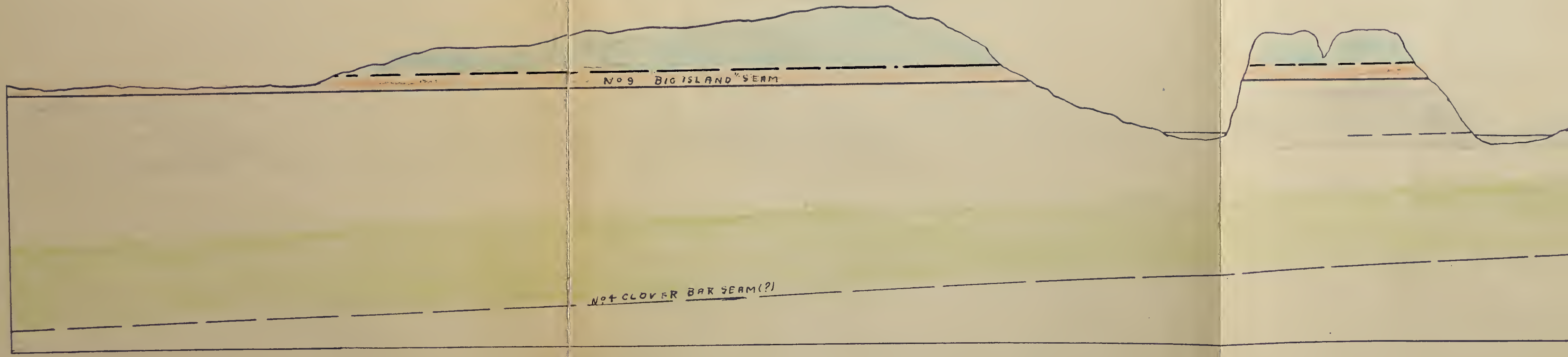
DATUM: MEAN SEA-LEVEL



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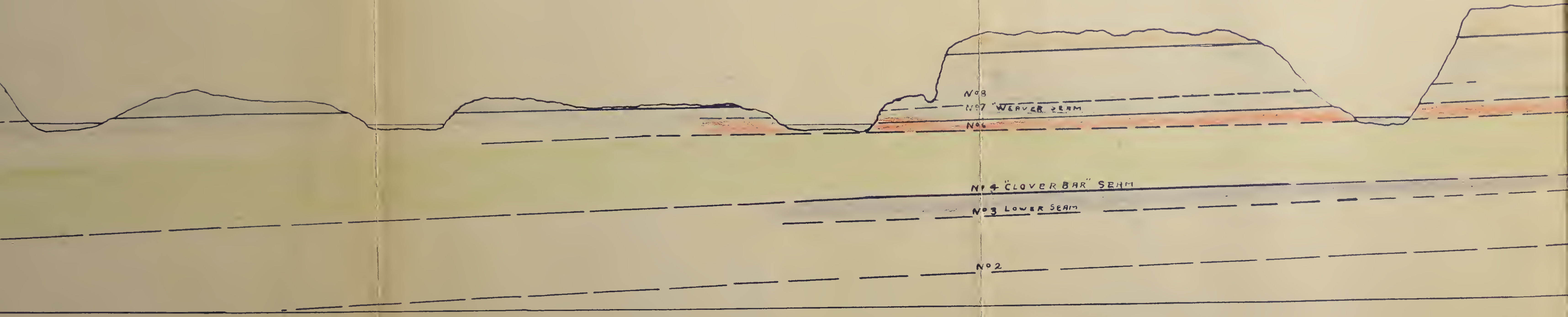


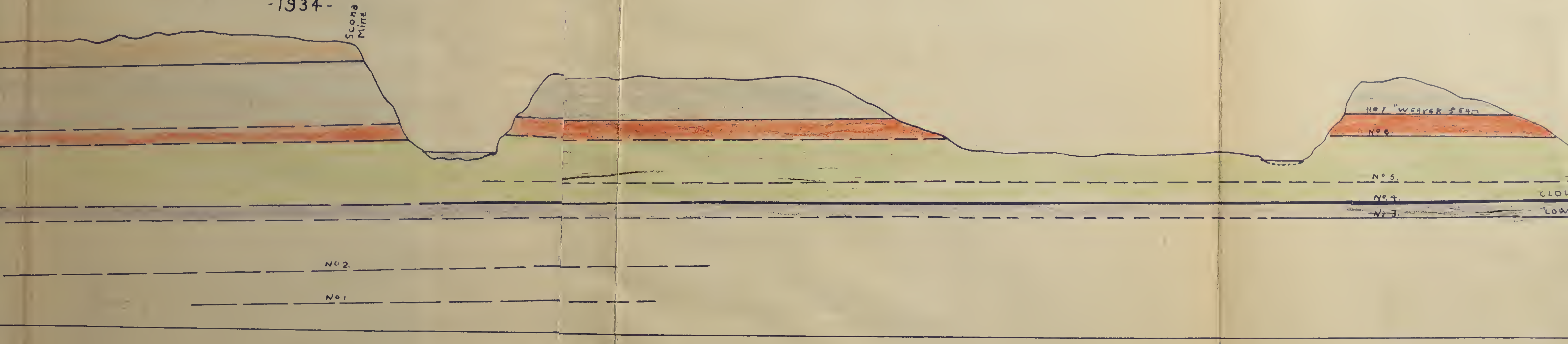
THE LINE A-B ON THE GEOLOGICAL MAP Nº 1.

HORIZONTAL SCALE:

VERTICAL SCALE:

1 INCH = 160 FEET

-1934-



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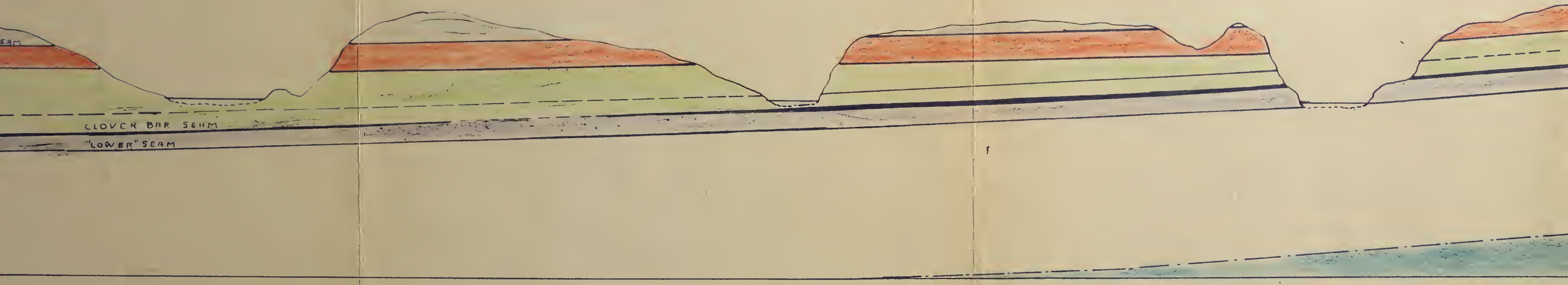
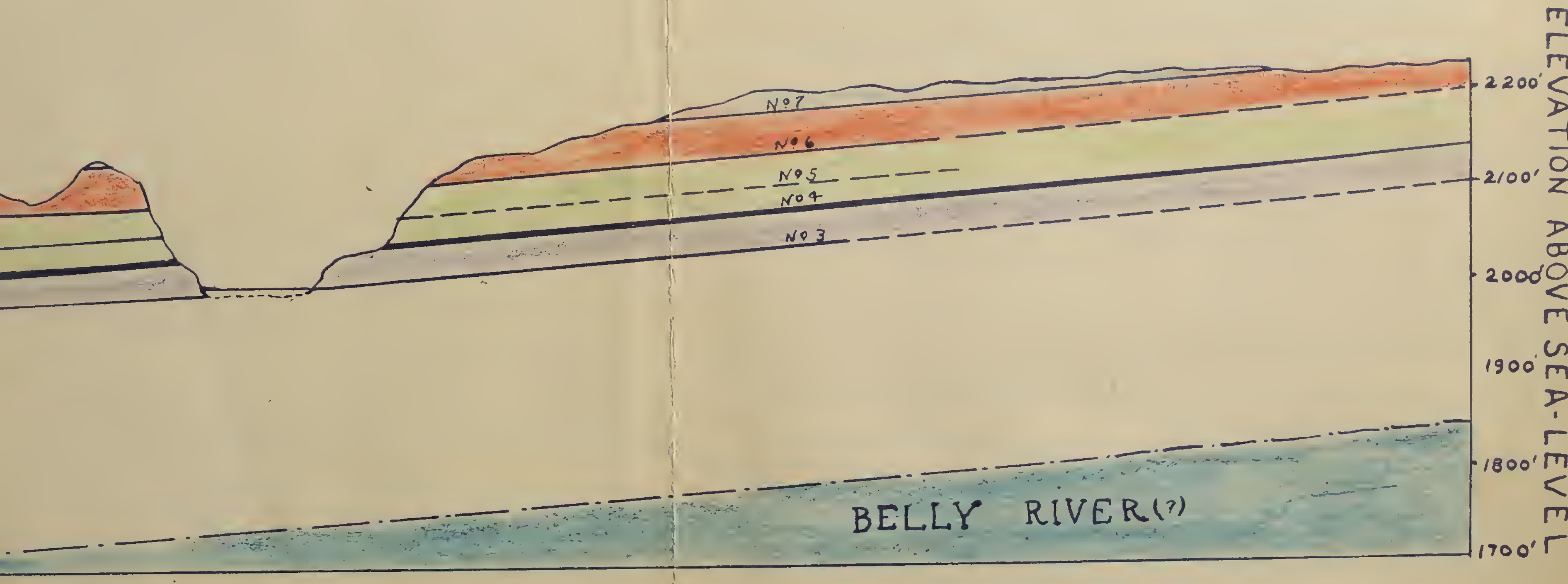


DRA

To Accompany Geological Thesis On Coal Of The Edmonton Area

By H H Beach



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